MODEL AIRPLANE NEWS

DECEMBER 1949 • 25 CENTS

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By BILL WINTER

THE beginner question has more ins and outs than a political campaign. It's much more than handing a kid a set of graduated projects, as any club leader can tell you. How to get the young newcomer to enter contests can be a baffling, discouraging business. For, while some experts have yelled for more beginner events and trophies, other leaders have found that such events with their awards all too often go begging. Thanks to Clarence Wells, *Bristol Aeromodeleers*, Pa., we have been following a round-by-round description of the great beginner's battle.

Wells is the guy who some months back mentioned local disappointment over the fact that beginners just didn't come out when the club put on special events. At the same time, he noted an almost complete vacuum in the beginners' events throughout his section of the east, including some of those monster newspaper sponsored deals. Since then, the Pennsylvania boys appear to have made headway with their beginners, only . . .

"For the past year our leader members have been working hard on the hardest of all tasks, that of getting our beginner and junior members to enter AMA sanctioned contests," says the man who wonders if you can win. "It was tough but as Joe Junior saw Dick Junior take a third with some old ship purely from lack of competition, the program began to grow until 50% of our Juniors were eager for the next meet to roll around. Then came the revolution.

"High places began to be taken by seven-year-old children in the speed events," continues the man from Doylestown. "The child's old man who flies in Open gets out his hottest ships, takes them off and, when they are peaking, puts the handle in the hands of the little tot who manages to hang on (thank heavens for that thong on his wrist) until he has made enough laps and then father takes over the controls and lands. The crowd gets a kick out of it but our Juniors, who build their own ships and crack a lot of them up before they can even fly in a meet, and earn their engines the hard way, are so discouraged that we fear our program will have to be begun all over again.

"This kind of stuff makes Junior competition into a big joke. It happened at Doylestown and at Far Hills, N.J., this year. The AMA works pretty well on the honor system but does everyone understand what *honor* is?"

Right now the world is full of the Wakefield post mortems. "If only" laments fill the air. Sad stories flew around as soon as the various eliminations had been held. R. S. Thompson, Richmond, Surrey, England, tells one about himself and friend P. T. Capon, designer of the *Crusader* Wakefield, once pictured in MODEL AIRPLANE NEWS. Both men usually build those gorgeous streamlined things, with many fuselage rings, stringers and ribs in gracefully tapered wings.

"Both of us prepared models for the Eliminations, and I built two for safety, having lost mine on a flyway the year before," says Thompson. "On the day, I put up No. 1 on a test hop. The free wheel locked when the motor ran out (90 secs.) and she spiralled all the way in. No. 2 did the first competition flight in good style but landed downwind. When I reached her, I found the rear half of the fuselage and one wing wrecked—don't ask me how. That finished me, so after watching Ron Warring's model turn in a peach of a flight, I went along to help Capon who had a new slab-streamliner, only to find that his wing and prop had gone. No chance to repair. Imagine the spectacle, two grown men trying hard to look as if it didn't matter. Capon's was a beautiful model, perfect finish, silk covered.

"Now for a request: I want to find someone in the states who will send me a copy of M.A.N. plans for the 'Faultless Chick.' In return I will give a plan of Warring's latest Wakefield. Also looking for flying scale plans to suit our small Diesels. Any offers?" (Address: 11 Leybourne Park, Kew Gardens, Richmond, Surrey.) Take our advice, men, and go after that Warring plan. An acknowledged expert on Wakefield models, Waring's last job is said to be capable of 4:45 in still air. That's tops.

Out in Little Rock, John Sadler, that perennial modeler and leader, is promoting a novice speed event to get more contestants. Sadler is the brains behind the *Lil Rocket* speed jobs that have put the Arkansas city in the No. 1 slot for this season's speed flying. Little Rock murdered the competition at both the Nationals and Plymouth. The ships have been winning in England and South Africa, too. Before passing on Sadler's idea we should mention that he was responsible for the low wing free flight school of thought pushed to successful group success before the Southerners forgot how to fly free flight.

H. A. Thomas, another Little Rocker, noted that Tulsa had an Elimination Meet

(*Turn to page 8*)

Jo Kotula

Our cover artist started drawing at age ten—saw his first plane a bit earlier and promptly forgot all about cowboys, etc. Took his first flight in a *Jenny* about 1926 in Pa. Started his own piloting in another *Jenny* in Tulsa; began commercial art work same time. Moved to Wichita, hotbed of aviation, then to San Antonio. Came to New York in '32 and soon started doing M. A. N. covers and is still at it. Began flying lessons in earnest in 1936, soloed in 3½ hrs. in a *Cub*. Owned a *Taylorcraft* for several years; been flying an *Ercoupe* since. Has five children, but has given up the race with Bill Winter!

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CONTENTS

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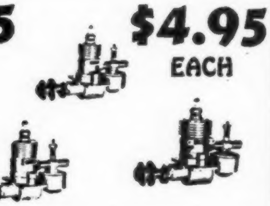

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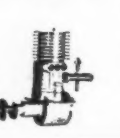

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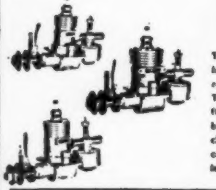

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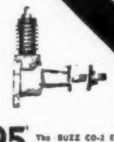

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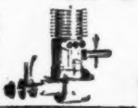

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RUSSIAN possession of the atomic bomb is only *one-half* the job of preparing for an aggressive war. The other half is possession of the means of delivering it, which, by no stretch of the imagination, do they have. This would require possession of one of three things; a 10,000-mile bomber, such as the B-36, an aircraft carrier task force, or a 5,000-mile guided missile. We are certain she has NONE of these things nor is she likely to create either of the latter two in the next 5-10 years. This leaves the strategic bomber as her most logical current problem and in this she has mother nature herself working against her. The famed Convair B-36 represents about the end of the line in the size category, and most engineers are agreed that a further increase in range would require an airplane of prohibitive size, assuming, of course, the use of gasoline engines. (An atomic power plant will change the entire concept of airplane design—but this is many years in the future.) The B-36 attains its remarkable performance by extremely ingenious design and light-weight construction, the methods of which are undoubtedly well-known to Russian engineers but the "know how" of which cannot be transmitted by any spy on earth. While this is not to imply that Russia cannot build a B-36-type bomber, it is extremely doubtful in the foreseeable future. It would require 3,500 hp Pratt & Whitney engines, which have taken 20 years to perfect; high-performance fuels, which have taken 50 years to perfect; high strength/weight material such as aluminum and magnesium, which have taken 30 years to perfect, etc. Russia has already covered some of these years; but until she has covered all of them, she cannot have the means of delivering her atomic bomb. And United States technology will not be standing idly by during these ensuing years.

AT THIS writing it is not at all clear how far the B-36 investigation will go. The first phase of the investigation, examination of evidence of collusion in the procurement of the huge bomber, has been completed without "one scintilla of evidence" that any fraud was present in the history of the airplane. But much more work is scheduled, including an examination of the tactical decisions, the respective roles of the Air Force, Naval Aviation, and Marine Corps Aviation in the national defense, the 65,000-ton carrier, etc. But the investigation thus far has proved beyond question that the B-36 is an enormously expensive airplane. For example, the final bill on the original contract for 95 B-36 bombers will average $6,248,686 for EACH bomber. It is already clear that well over one billion dollars will be expended on the project, and that means that the huge bombers will cost every man, woman and child in the U.S. about $7.00 each! But this is a ridiculously small price to pay for the protection such a striking force can afford.

BRITAIN'S air power is flying high these days with the simultaneous fruition of many, many long-term projects. The huge Bristol *Brabazon*, whose dimensions are remarkably close to those of the B-36 (Span 230′, length 177′, gross weight 290,000 lbs.), will never see service but it successfully bore aloft the honor of becoming the largest airplane ever built in the British Empire. Turboprop versions, now under construction, are planned for use on a nonstop transatlantic service. Four British turboprop airliners are now flying (Vickers *Viscount*, Handley Page *Hermes V*, Armstrong-Whitworth *Apollo* and Miles *Marathon*) together with two British turbojet airliners (DeHavilland *Comet* and the Canadian Avro C-102). Thus, despite tremendous U.S. research and development progress in this new field, the British are obviously well ahead in the battle.

GREATEST technical interest at the recent 10th Annual exhibition at Farnborough, sponsored by the Society of British Aircraft Constructors, centered about the Avro 707 "delta-wing" research airplane, two new versions of the DeHavilland *Vampire* jet fighter and a new Gloster *Meteor* (Mk VIII), one version of which features tailpipe afterburning. The Avro craft (it is not a fighter) is a special research airplane being used to obtain data for the design of a delta-wing jet bomber. It is powered by a single Rolls-Royce *Derwent* turbojet of 3,500-lb. thrust and, therefore, is not capable of the super-speed its lines might indicate. The DeHavilland DH-112 *Venom* is a standard *Vampire* with a 5,000-lb. thrust DeHavilland *Ghost* turbojet engine, a new, thin, high speed wing and wingtip tanks. The DH-113 is a two-seat night-fighter version of the famed jet fighter, powered by the standard *Derwent* engine. The new Gloster *Meteor* is powered by two *Derwent*

(*Turn to page* 60)

REPORT FROM THE WEST

by Lew Mahieu

ON the West Coast, the month of September was full of contests and record trials. We shall tell you about a few of them which we attended.

Congratulations to the *Sky Kings Model Club* on the way in which they handled their First Annual Meet, when 127 modelers from Southern California competed. Held Sunday, September 11, at Clover Field, Santa Monica, the *Sky Kings* handed out 37 trophies to the winners in 15 controline events. Winners were: *Class A Speed Open—1.* J. Strom 111.25 mph; 2. Lew Mahieu; 3. Steve Jentges; *Amateur—1.* Hellman and M. Jordan 111.25 mph; 2. Bob Miller; 3. J. McKay; *Class B Speed Open—1.* Lew Mahieu 134.22 mph; 2. Dick Rigney; 3. J. Strom; *Amateur—1.* J. McKay; *Class C. Speed Open—1.* Dick Rigney 136.36 mph; 2. C. Schuette and B. Launderdale; 3. J. Strom; *Amateur—1.* J. McKay; 2. Steve Jentges; *Class D Speed Open—1.* Lew Mahieu 147.80 mph; 2. J. Strom; 3. Bill Wisniewski; *Amateur—1.* Bob Miller 139.20 mph; 2. J. McKay 3. Joe Green; *Precision Open—1.* Hank Bourgous; 2. Bob Palmer; 3. Gene Marshall; *Amateur—1.* Harold Selson; 2. M. J. Beiber; 3. M. Peters; *Team Racing—1.* Gerry Gaston; 2. Cliff Potts; 3. L. Cornel; *Team Stunt—1.* Palmer and Slagle; 2. Marshall and Becker; *Scale—1.* Howard Waldo; 2. Ed Estrada; 3. Ced Galloway; *Novelty—1.* Hank Bourgous; 2. Joe Green; 3. J. R. Slater; *Jet Speed—1.* A. R. Christensen; 2. Joe Green; 3. George Hume.

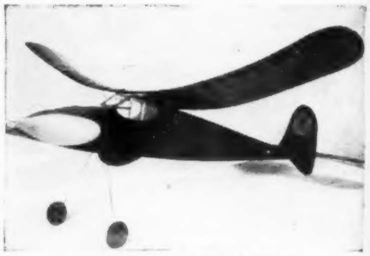
The *Sky Kings Model Club* is sponsored by the Hughes Aircraft Employee's Association. Joe F. Carpenter is president and Robert C. Steinbach fills the secretary position.

Three new AMA speed records were set—two of them by Dick Rigney. Class B Open 134.22 mph; Class B Senior 132.25 mph; Class C. senior 136.36 mph. Dick Rigney's model activity has been somewhat slowed up; he is now using the two-year scholarship he won in the 1948 Western Open Meet. Dick says he likes Cal-Aero fine—they have a dorm just for model builders. They *have* to—modelers make so much noise!

A 400-mile drive recently paid off! Joe Bilgri, of San Jose, and a member of the *Oakland Cloud Dusters*, drove all the way to Southern California to fly indoor record trials with Frank Cummings, Bill Atwood, Don Kennedy and the other hot indoor boys. The record trials were held in Blimp Hanger No. 1 at the Santa Ana Air Base September 4, 1949. Well, Joe did it—his record time was 21:00.4 in C cabin, this was the only record broken that day.

A few months back we mentioned that Marvin Irwin changed his hobby from model airplanes to photography. On our last visit to see Marv, we noticed all kinds of new big equipment in his darkroom. Yes, you guessed it, he has changed his occupation too. He now is a commercial photographer and we might add, that he is turning out some very sharp pictures.

It was a nice day September 18, when the *Los Angeles Aero Modelers* held their Annual Glider Contest at Western and Rosecrans Avenues, with Frank "Pappy" Greene as contest director. The big gliders walked off with the top places. Marvin Forman, of Santa Monica, finally managed to get his huge 12' towliner in the air three times to win that event. Nice flying, Marvin, (or should it be nice towing?); this glider weighed in at seven pounds, you know. Ray Acord's big Class D Hand Launch did the job again. The *Monster* repeated its performance as if it were at the Nationals and won another first. Russ Snyder, also flying a *Monster*, established a new record in the Senior Class for D Hand Launch, with a three-flight total of 5:49.5. The winners were: *Hand Launch Glider Senior—1.* Ray Acord 14:04; 2. Al Trainor 11:30; 3. F. Powell 10:30; *Jr.—1.* R. Isaacson 3:20; 2. G. Wallock 2:03; *Towline Glider Senior—1.* Marvin Forman 26:00; 2. Bob Hanford 20:14; 3. Ced Galloway 15:16; *Junior—1.* Minier 8:45; 2. R. Allen 4:38.



Andy Petersen's Wakefield job

Think we owe an apology to Sam Beasley. In the October issue of MODEL AIRPLANE NEWS we told of a fellow who claimed 216 mph with a .29. Sam's name was connected with the story and now everyone comes up to him and asks the question—Are *you* the one who went 216 mph? . . . Frank Stone said in a letter we received that Sam acts like he's upset. Our apology, Sam.

The *San Valeers* lost one of the most popular members and Southern California lost one of her top free flight men—Paul Gilliam. Paul moved to Texas; we can't understand why, but maybe we will hear from him, and if so, will pass the word along to you.

The Long Beach Jr. Chamber of Commerce held their 2nd Annual Free Flight Gas Contest, Sunday, September 25, at Long Beach, Calif. The wind was blowing about 20 mph which caused the times to be low and also caused about 50 modelers to leave their planes in their cars. The Army furnished two jeeps for plane chasing. Thirteen beautiful trophies were awarded to the following winners. *Class A Gas—1.* David Converse; 2. Russ Snyder; 3. Don Hoyle; *Class B Gas—1.* Charles Schoneman; 2. Al Trainor; 3. Nat Antonioh; *Class C Gas—1.* Milton Ronney; 2. Ray Acord; 3. Lew Mahieu; *Class D Gas—1.* Lew Mahieu; 2. Ray Acord; 3. J. M. Thompson; *Junior High Point Trophy*—Gene Wallock.

The *Los Angeles Aero Modelers* will hold their Annual U-Control Meet on November 13, at Western and Rosecrans Avenues.

In the next issue of MODEL AIRPLANE NEWS we will give you a report and pictures on the 4th Annual All Western Open, at Los Angeles and the 4th Annual Las Vegas U-Control Meet, Las Vegas, Nevada.

Jim Amis, of Seattle, with modified Thermic 100

Scrap Box

(*Continued from page 1*)

having a combined Novice speed class. In Tulsa they pick the winner by subtracting one half the engine displacement from speed. Sadler proposes going a step further, combining age classes as well as engine categories, the highest per cent of the state record to determine the winner. For example, a boy flying an A job is judged on the per cent his speed is of the A state record. Sadler hopes that this development would lead to more speed flying. Well, someone better do something about speed before it gets worse.

A clip from a Tulsa program indicates that, with all engines combined, timing is done for three laps. The Tulsans also go in for 1/2 A free flight. All their free flight events are R.O.G., weather permitting, except for the Baby jobs. These are permitted a 30-second engine run, an additional 5 secs. being allowed before disqualifying the flight. Ten seconds is subtracted from the flight time for every second of motor run over 30. Our question is—How do you see the things after a 30-second run? No kidding, these little jobs really get high in a hurry.

Speaking of durations, has anyone got an idea for a dethermalizer for the radio control boys? What they say about some thermals being strong enough to take up anything that is airborne, seems to be true. The radio jobs, batteries and all, are hooking thermals.

"A real contribution to the art of radio control," says Harry Geyer, (he who was scared in his tent by the *Constitution* at Olathe and wonders who snitched!), "would be a gadget or method of adjustment to act as a dethermalizer. Not just down elevator either. On August 6, a friend of mine flying a *Rudder Bug* on its fourth flight hooked a thermal on a 45-second motor run. It soared out of sight under full control while spiralling in a thermal. A fellow exercising his dogs found it four miles away.

"One fellow has a Zaic 84-inch glider," continues Geyer. "He has had lots of fun with it because of the lack of motor and vibration troubles. When the radio became duck soup, he got tired of running the tow. There is an awful urgency to find a thermal immediately off the hook. So he installed an *Arden .099* on a mount above the wing. It climbs at a 15° angle. Last Saturday he got a ten-minute motor run and spent an additional five minutes spiralling it down out of the thermals. The weight is 54 oz., power loading 540 oz. There is an ideal way for the beginner to pick up radio control. Zaic called for 34 oz. flying weight and this fellow beefed it up to 49 oz."

This business of soaring R.C. jobs is a brain tickler. At least, we have something new to puzzle over. After watching Gelvin spiralling in a thermal almost out of sight at the Nationals, and seeing other R.C. jobs glide about with the greatest of ease, we gambled on a 5.7 aspect ratio on our new ship to see if it would increase the rate of sink. This was suggested by the Piper *Clipper* which utilizes low aspect ratio to get a steep descent without the use of flaps. You wonder how far to go. First, a slow glide means less damage in bouts with trees and obstacles. But the gentle glide is a thermal tempter. One question is evident —Is it a mistake to stick in a thermal, even if the ship is in a spin? Would it be better to fly straight to leave the thermal? If we adjust free flights to circle, why not fly the radio control job straight when it hits a thermal? Or will it get out of sight before it gets away from the thermal? As to dethermalizers, pop-up tails don't look good. They work by giving the model a rate of sink somewhat like a parachute. A heavy ship coming to earth with solid batteries and a radio in its cabin is a horse of a different color. Possibly, a drag chute would be a workable deal. Fly the ship straight with the chute streaming behind. But then perhaps the chute would slow the ship down so much that it would not leave the thermal before going out of sight. If we sound mixed up, that's because this is radio control! It isn't the radio half as

much as it is the flying. Anyway, Walker has a dethermalizer that always works—Firecrackers!

Do you mind if we talk a little more about R. C.? The "*Scrap Box*" isn't getting preoccupied with pushbutton warfare, but the radio control field is moving along fast and you'll want to know about it, against the day you get the chance to put your own remote control ship into the air. C. O. Wright, AMA president, still pushes the fight for license free operation; is looking into such license free operation in Great Britain. Meanwhile, at least three manufacturers are working on transmitters and receivers for the Citizens Band. While this band requires no amateur license, there is little evidence at the moment that such equipment is certain of near future approval. Nor is it clear what such equipment will cost. It should be pointed out that the battle for license free operation has been going on for the past several years. Maybe even price of radio control will come down as more people begin to fly. See where Rockwood is offering a beginner's model consisting of an RK61 receiver, an escapement rudder actuator, simple transmitter, antenna elements, at $25 or, with tubes, $31. As with all other makes, this requires a license at present.

Speaking of radio control, Keith Storey discussed with us at the Nationals some of the details of a proposed pylon R.C. speed models. The degree of controls required for what they hope to get out of these ships sounds impossible to anyone who has wrestled around on rudder only, and constantly occurring "pilot" error, but then nothing is impossible. Can't say whether Keith was kidding or not, but it seems these things would be dragged in under power for a landing. Anyhoo, the F.A.S.T. boys are said to be developing shoulderwing models of the Goodyear type.

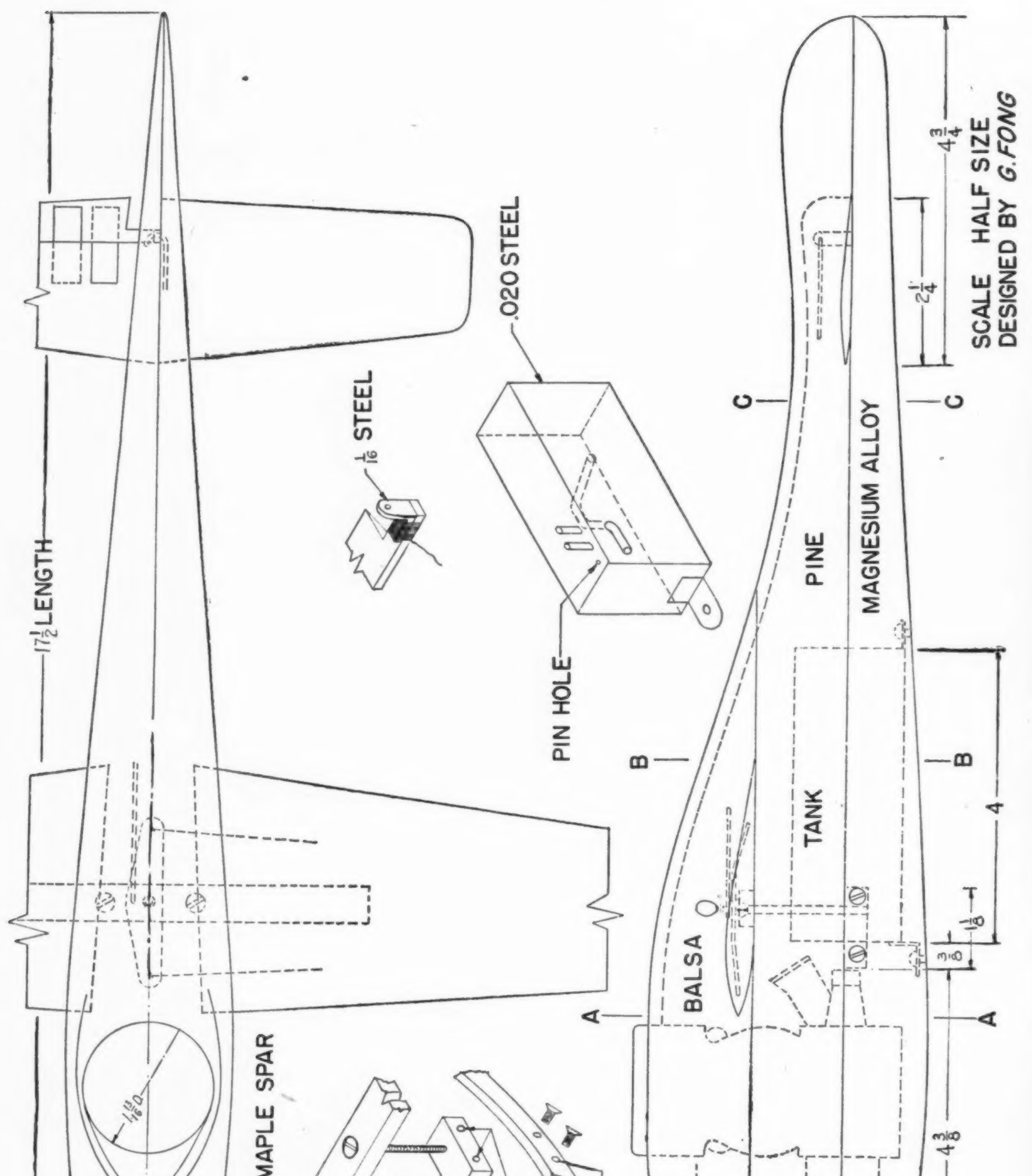
There's a movement afoot in England to arouse interest in a National Free Flight Contest to be held at Cranwell just before the next Wakefields in Finland. This would enable American modelers to have a really worth-while trip next year. The Englishmen currently compete under a free-for-all setup without age group classes. There's talk of instituting Junior and Senior, as over here. While some of us wonder how to combine age groups to simplify contests, others would copy our system—and probably end up equally SNAFUed.

"I am an avid reader of second-hand copies of MODEL AIRPLANE NEWS," says Fred G. Birden, an Englishman, "twenty-five years old, have two small children, already model addicts. On the staff of the local grammar school in the science departments. Keen on all flying models, particularly the precision type that look like real airplanes, but have a real longing to be able to stunt. Dabbling in homemade R.C. and controline jobs in small sizes due to the lack of a suitable motor. Dislikes: dirty glow-plug motors, pylon jobs, and windy days."

The gist of all this is that Fred is looking for a correspondent; also anybody interested in trading a good spark ignition motor of the *Forster 29* type. Inasmuch as the British have highly developed the small Diesels—which are as popular as glow over here—Birden may have something worth while to offer. (Address: 47 Radford Drive, Brownstone, Leicester, England.) Speaking of swaps, several British builders are wondering who sent them engines. Don't forget full name and address; if you've swapped anything without receiving an answer, we suggest you check up. Trouble is the "*Scrap Box*" can't read their writing either!

One of the most unique trophies in existence is the Robber's Challenge Trophy, first awarded last summer at the Plymouth Dealers of Northern California Controline Meet at San Francisco Polo Grounds. Set up by "Mom" and "Pop" Robbers to encourage various team competitions between clubs of the Western Associated Modelers, the Challenge Trophy was won first time out by Ilse Favre and Don Brandon. There was nothing unusual about a mixed team of two winning the trophy, as the rules for the occasion called for teams of two, one member to be a woman. Challenges may be

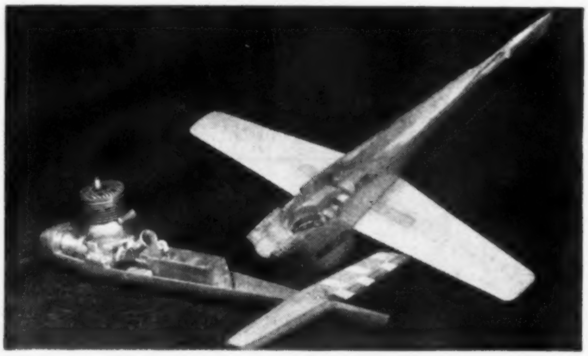
(*Turn to page 39*)

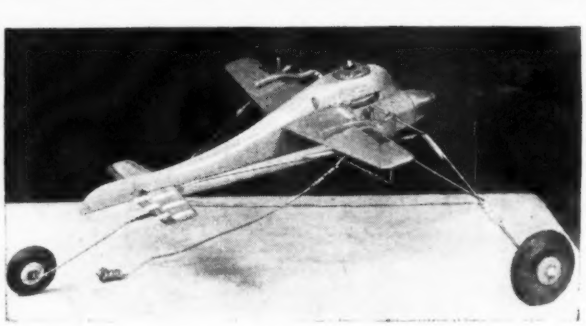

17 1/2 LENGTH
1/16 STEEL
.020 STEEL
PIN HOLE
MAPLE SPAR
6-32 SCREWS
6-32 TAP
4-40 TAP
4 HOLES
4-40 DRILL
1 13/16 D
A
B
C
BALSA
TANK
PINE
MAGNESIUM ALLOY
4 3/8
3/8
1 1/8
4
2 1/4
4 3/4
SCALE HALF SIZE
DESIGNED BY G. FONG

hell razor

by GEORGE FONG

This ship won Senior D speed at the Plymouth Meet with 142 mph, and has since topped this to fly 159.23 mph for an Official AMA record





HAVE you been searching for a Class D speed model that is easy to build, safe to fly, durable and fast? If so, the *Hell Razor* is your ship!

Fourteen months of designing and testing went into this model. The original was built of balsa using 3/8" birch plywood motor mounts. It weighed 26 oz. and the top speed was 133 mph. The second model was built using a pine bottom with a magnesium crutch. This job weighed 28 oz. and top speed was 140 mph. The latest model, the one used in setting the Senior Class D record, has a magnesium alloy bottom, with a pine wing and top shell. On the first test the speed increased to 148 mph and the ship weighed 32 oz. At the Plymouth International Meet this summer the speed dropped back to 142 mph. This drop was due to the difference in the humidity and altitude which worked against our regular fuel mixture. Two weeks after the Plymouth Meet, at Trenton, N.J., the *Hell Razor* really turned in a fine performance by setting a record of 159.23 mph.

On all these ships we used the same motor, a standard *Dooling*. Also, the fuel is that recommended by the motor manufacturer, although, of course, we "doctor it up" a bit to fit different localities and weather conditions. The propeller used on the final record flight at Trenton was a standard *Rev-Up* of 9" diameter and 13" pitch.

There are still more miles per hour in this design to be achieved. With a little more experimentation on fuels and propellers, we hope to be able to turn in at least 175 mph without too much trouble. So much for the history of the job. Let's get started on the construction.

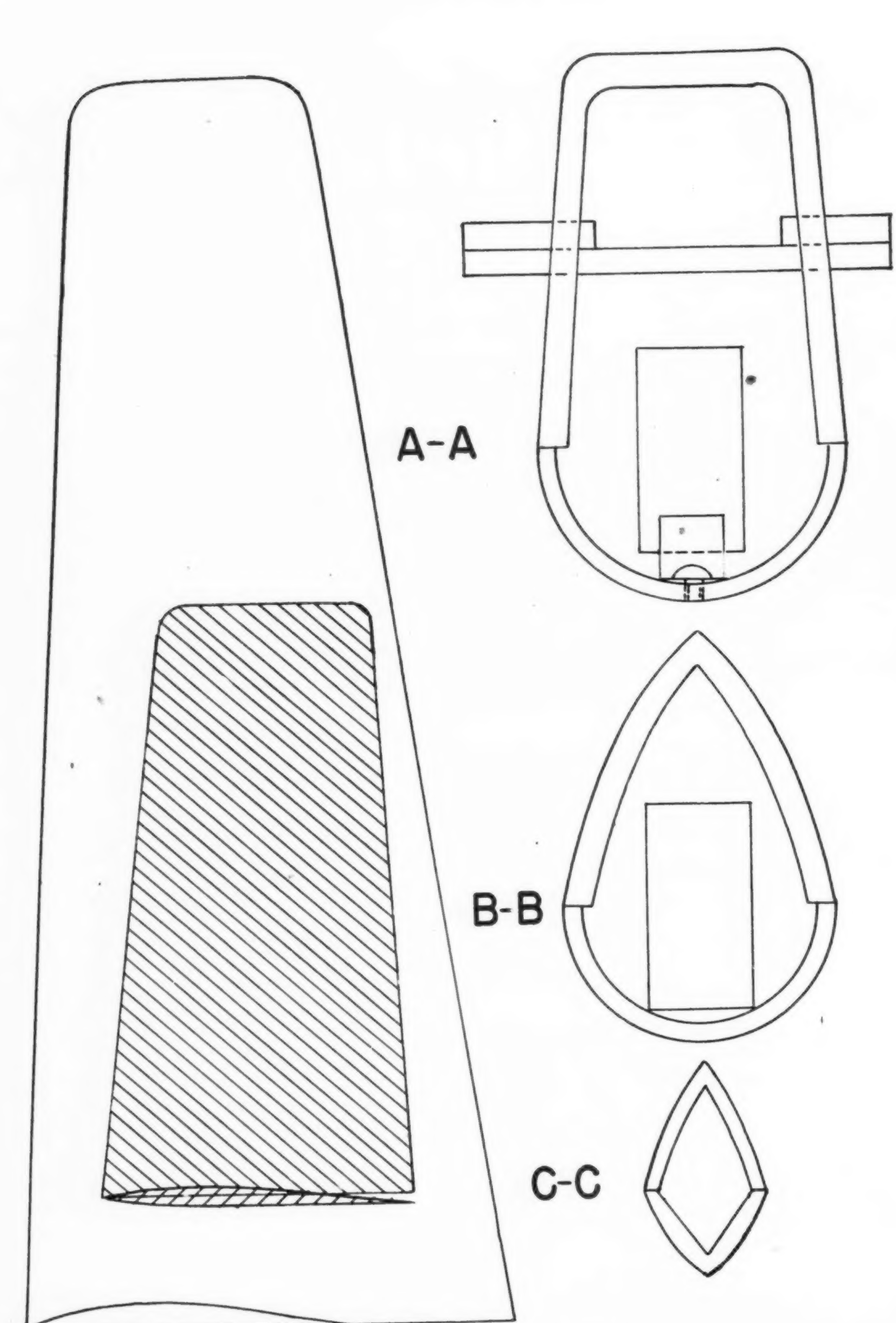
Fuselage. The first step is to make a pine pattern of the bottom of the fuselage. Have a magnesium alloy casting made at your local foundry. (For those who haven't the facilities, or don't wish to bother making the alloy fuselage bottom casting, we understand that it can be procured commercially.) After you receive your casting, install the engine in this bottom shell, using 6/32 bolts. Tap hole drill size is No. 35. The motor mounting lugs of our *Dooling* rest on the upper edge of the metal casting and this gives the proper location of thrust line. If other engines are used, make sure that the thrust line comes out as shown on the plans. No motor offset has been used.

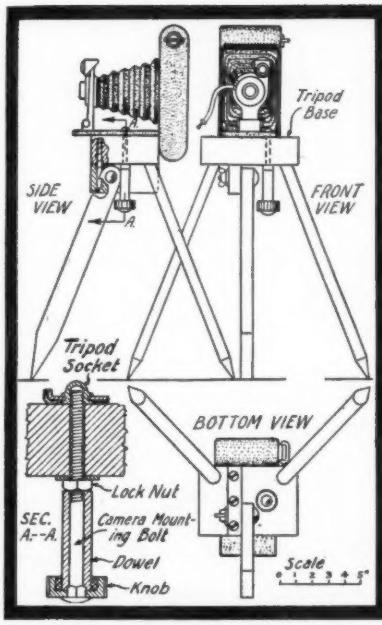
The next step is to build the top half of the fuselage from a 1/4" x 2-3/8" x 18" pine block. Draw a center line on the block and locate the center point of the cylinder hole. Drill or saw this hole 1/8" larger than the cylinder head.

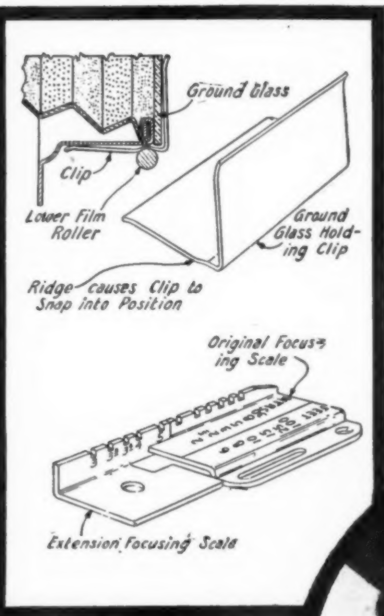
The fairing block is made of 1-3/8" x 2-3/8" x 10" balsa. Draw a center line and locate the center of cylinder hole, as on the top shell, with the exception that the cylinder hole in the fairing should be a snug fit. Hollow out the front of the pine shell so that it will fit over the engine; then spot glue the fairing block in place. After the cement is dry, draw side and top views on the blocks as indicated on the drawing, and cut and sand to shape. Next, hollow out the entire inside of the pine top shell (but *not* the balsa fairing block) to 3/16" wall thickness.

Wings. Wing is made of 3/8" x 3-1/2" x 18" pine. Install a maple spar as indicated on the plans. Draw the wing outline on the pine block and cut to shape. Cut the airfoil section to shape with a wood plane, checking the contour with a template to assure that both sides of the wing are the same. Then cut 1/4" grooves into the wing to accommodate control wires. Drill two 3/32" holes in one wing tip for the wire guide tubing. Next, install bellcrank and wires, fill in the grooves with pine

(*Turn to page* 61)


A-A
B-B
C-C
SECTION FOR WING AND STAB





PART TWO

The author begins a detailed description of his photo accessories

Underside of tripod is simple and rugged

Model Portraiture

by RAY RUSHER

TRIPOD—A short tripod having non-telescoping legs but one of them pivotally adjustable will be found quite satisfactory and not at all complicated to make. Most of your models can be posed either on the floor or on a support close to the floor. If you need the camera mounted higher, the tripod can be placed on a *solid* box, chair, or table. A wooden wedge under one leg of the latter will eliminate all rocking.

The tripod consists of a base made from a piece of wood cut from a 2 x 4, 5/8" or 3/4" dowels to form two fixed legs and a 1" x 2" strip to form the third (pivoted) leg. A carriage bolt equipped with a wing nut serves to lock the pivoted leg in any adjusted position. This leg can be swung forwardly to point the camera down at a considerable angle. By swinging it backward the camera can be pointed upward. If the angle is still not great enough, the pivoted leg or the two fixed legs can be blocked up to suit your requirements.

The camera is held on the tripod base by means of a camera mounting bolt of the proper size to fit the threads of the tripod socket of the camera. The size is usually 1/4"—20 threads per inch. The bolt should have a lock nut positioned so that the bolt goes all the way except one thread into the tripod socket; the camera can then be clamped securely to the tripod base when the bolt is tight. For convenience in turning the bolt it should be extra long as illustrated to clear the pivoted leg mount and provided with a knurled plastic bottle cap which serves excellently as a knob. A dowel with a hole drilled lengthwise through it serves as a spacer between the lock nut and the knob.

FOCUSING ON GROUND GLASS—If you have procured a secondhand camera, be sure it is clean and free of dust. This applies especially to the lens. Dust out the camera if necessary with a clean camel-hair paint brush that has never been used in paint. An air bulb will also be helpful. One about 2" or 3" in diameter such as used on automobile battery testers or for supplying battery water to a storage battery is suitable. It should have a discharge orifice about 1/16" in diameter. Don't blow your breath into the camera as it contains moisture which is detrimental to the materials of which the camera is made, and to the stop and shutter mechanisms.

Lenses should be free of dust and by all means never touch their surfaces with the fingers as the result will be a greasy smear difficult to remove. If bulb and brush are sufficient to clean them so much the better. If they must be wiped, use a clean soft linen cloth or lens tissue and lens cleaner fluid if necessary, after being sure all dust and lint have been brushed or blown away. Use a rotary motion and rub as little as possible to secure the desired result. Use light pressure so as to minimize the possibility of scratching the lens surface. Camera lenses are made of soft glass highly polished and can be much more easily scratched than spectacle lenses or ordinary glass. If the camera is new or has just been overhauled by a repair shop, it shouldn't need any cleaning.

Unless you have a camera equipped with a range-finder coupled to the focusing mechanism or an accurate focusing scale to be set after actually measuring the distance from the subject to the lens, sharp focus is possible only by using a viewing screen such as ground glass. These are available at most any camera shop for twenty or twenty-five cents. With the back of the camera removed measure the outline of the frame around the film exposure opening and get a piece of ground glass this size, or a larger one and cut it to size with a glass cutter. The ground glass can be held on with scotch tape or a holding clip can be made from a piece of tin.

Most cameras have a focusing scale graduated in feet such as 6, 8, 10, 25, and 100 (or sometimes INF for infinity). If the bellows can be extended another 1/2" or so by cutting away the limit stop at the outer end of this scale and this doesn't stretch the bellows excessively, an extension scale can be added so that pictures can be taken at possibly 3 to 5'

With the camera mounted on the tripod and the ground glass in place, arrange a white card for focusing about 2' in front of the camera and illuminate it with two 100 W bulbs shielded by reflectors from the camera lens. The card can be attached to a wall with scotch tape, and ordinary (*Turn to page 44*)

Cleveland Air Cleveland Races Cleveland

The top Goodyear Race winners. At left is Steve Wittman, who came in 3rd. He and winner Bill Brennand (center) flew Wittman racers. 2nd place man Keith Sorenson at right

by JOHN L. MACKENZIE

THE fortieth anniversary of international air racing was appropriately observed at the Cleveland Municipal Airport on the Labor Day week end with new records established in every category of our great air classics. In the Bendix Derby, the Thompson Trophy Race, and the Goodyear Trophy Races, old speed marks passed into oblivion, but veteran racing pilots retained the laurels.

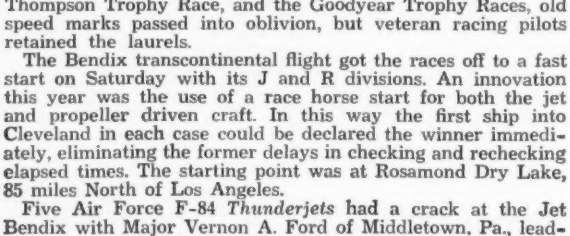
The Bendix transcontinental flight got the races off to a fast start on Saturday with its J and R divisions. An innovation this year was the use of a race horse start for both the jet and propeller driven craft. In this way the first ship into Cleveland in each case could be declared the winner immediately, eliminating the former delays in checking and rechecking elapsed times. The starting point was at Rosamond Dry Lake, 85 miles North of Los Angeles.

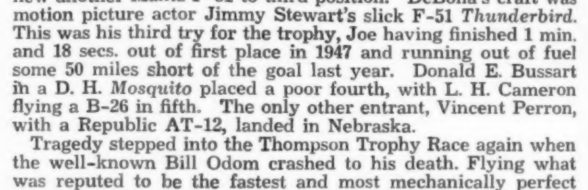
Five Air Force F-84 *Thunderjets* had a crack at the Jet Bendix with Major Vernon A. Ford of Middletown, Pa., leading the way. Including a refueling stop at Salina, Kansas, Major Ford's elapsed time was 3 hrs. 45 min. and 51 secs., or a speed of 529.614 mph. This is the first time in Bendix history that the flight has been made in less than four hours.

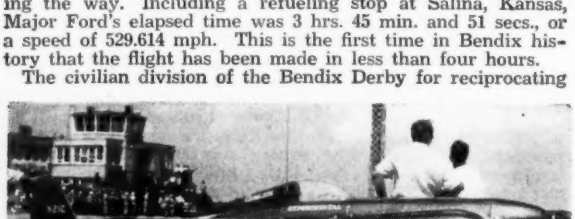
The civilian division of the Bendix Derby for reciprocating engine planes was decided by a much wider margin than has been seen for several years. Joe DeBona, transcontinental record holder, made the trip at 470.136 mph in 4 hrs. 16 min. and 14 secs. This bettered Paul Mantz's 1947 record by 10 min. and 10 mph. Joe's closest rival, Stanley Reaver, came in 13 min. later in one of Mantz's *Mustangs*. Herman "Fish" Salmon flew another Mantz F-51 to third position. DeBona's craft was motion picture actor Jimmy Stewart's slick F-51 *Thunderbird*. This was his third try for the trophy, Joe having finished 1 min. and 18 secs. out of first place in 1947 and running out of fuel some 50 miles short of the goal last year. Donald E. Bussart in a D. H. *Mosquito* placed a poor fourth, with L. H. Cameron flying a B-26 in fifth. The only other entrant, Vincent Perron, with a Republic AT-12, landed in Nebraska.

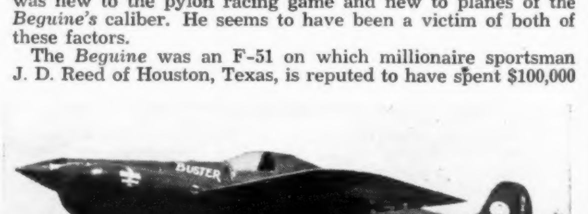
Tragedy stepped into the Thompson Trophy Race again when the well-known Bill Odom crashed to his death. Flying what was reputed to be the fastest and most mechanically perfect ship ever entered in the big race, the round-the-world flier was a favorite to win. But Odom, though fine pilot that he was, was new to the pylon racing game and new to planes of the *Beguine's* caliber. He seems to have been a victim of both of these factors.

The *Beguine* was an F-51 on which millionaire sportsman J. D. Reed of Houston, Texas, is reputed to have spent $100,000

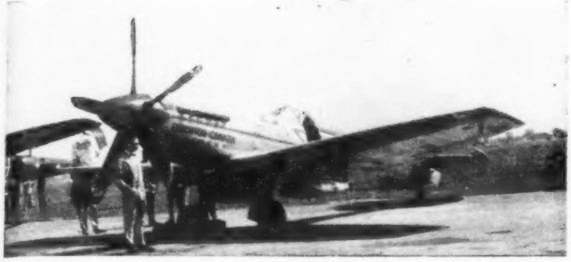


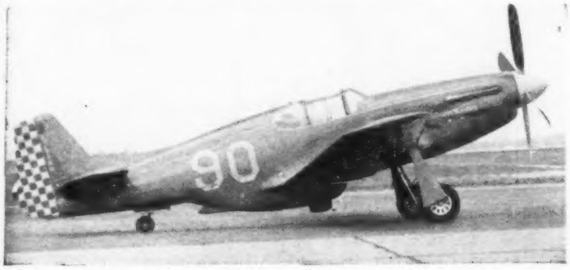






Top right—*Minnow* flown to 5th place by "Fish" Salmon. Top left—Wittman's *Buster*, the top Goodyear winner, had pants added this year. Lower left—Cliff Mone flew *Estrelita* to 6th place. Lower right—Sorenson took second with the *Mike Argander Special*





Top left—Canadian J. H. G. MacArthur took 3rd in Tinnerman Race with this *Spitfire*. Top right—Anson Johnson's modified F-51. Lower left—Jimmy Stewart's *Thunderbird*, flown by Joe DeBona, won the Bendix. Lower right—modified AT-6 flown to 1st place in Woman's Race by Grace Harris

to produce a Thompson winner. The most apparent change in the ship was its barrel shaped wingtip radiators. These, of course, cleaned up the fuselage by eliminating the belly radiator. A special racing propeller and the finest finish ever seen on a racing airplane were also much in evidence. The special radiators increased the aileron effectiveness and made the ship excellent for tight pylon turns. Jacqueline Cochran bought this racer from Reed at an unnamed figure just three weeks before the race and engaged Odom to fly it.

The Thompson was flown on a 15-mile circular course, marked by seven pylons this year. The new layout allowed for much shallower turns than the old four pylon rectangle and was designed for greater safety. But in rounding the No. 2 pylon on the second lap, Odom's oversensitive plane carried him too far around in his steep left bank. Bill immediately swung over into a right bank to get back on course, but in so doing he rolled completely over on his back. His scant altitude was insufficient for recovery and the speeding plane plunged into an occupied dwelling. Unfortunately, two residents of the house perished with the famous flier.

Cook Cleland became the only man other than Roscoe Turner to repeat a Thompson victory when he broke his own record with a new mark of 397.071 mph. Cook left nothing to chance in planning for the big race this year. He clipped 8′ off the wingspan of his giant *Corsair* and installed large aluminum end plates on the stubs to prevent loss of lift by end spillage. He arranged his exhaust system to augment the propeller thrust by jet effect. And, of course, he used the methyltriptane fuel which he introduced last year (Needless to say, Cleland's competitors also used this alcohol-petroleum mixture.) But Cook's secret ace in the hole was a little item picked up from confiscated German files, *the use of concentrated hydrogen peroxide in the water injection system.*

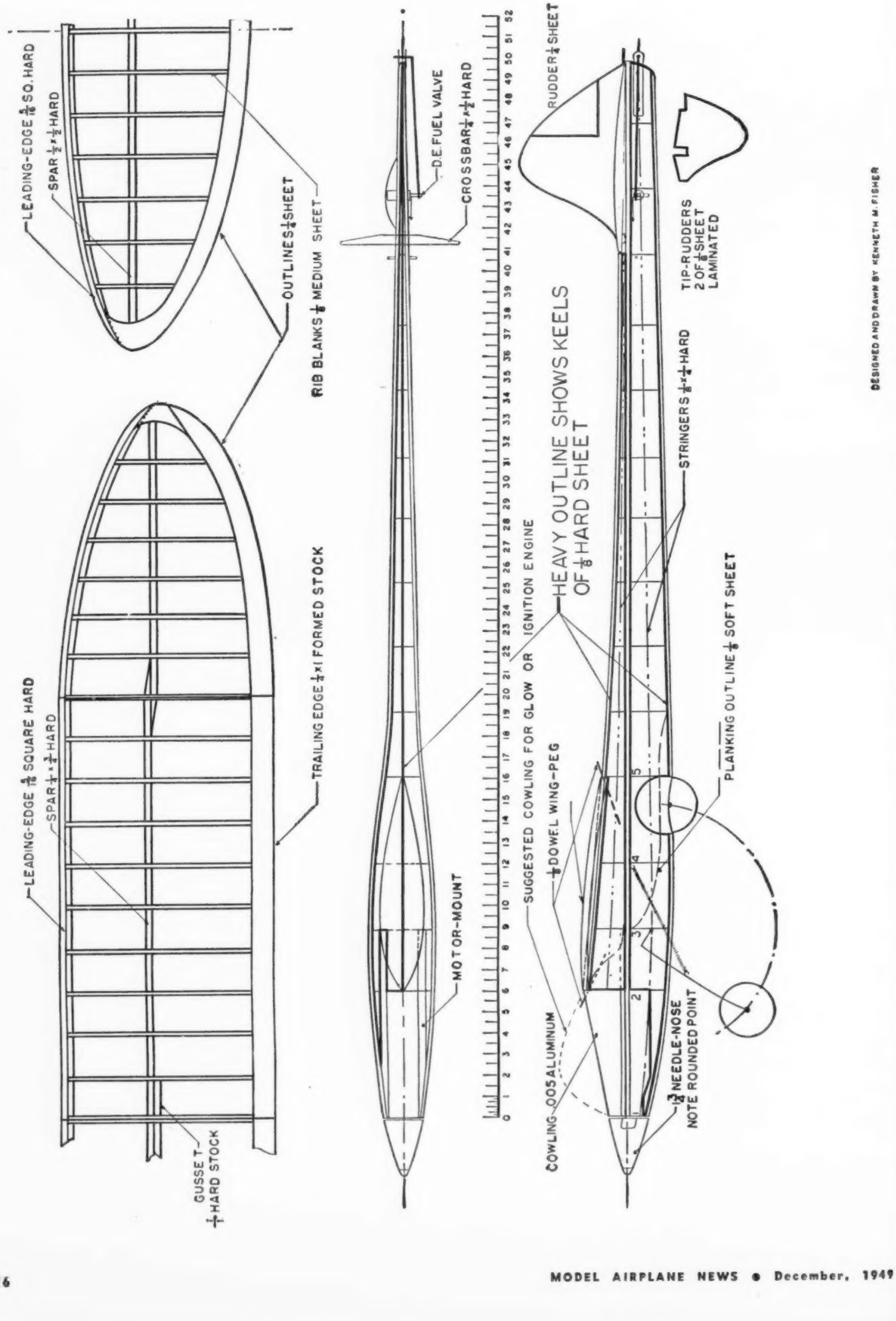
All in all, it was a big year for the *Corsairs* again. Ron Puckett of Lansdowne, Pa., flew his own F2G-1 to second position while Ben McKillen, chief pilot at Cook Cleland's Willoughby, Ohio, airport, captured third position in one of Cook's ships. High qualifying time of the meet was registered by Dick Becker at 414.592 mph in a third Cleland *Corsair*, but he was eliminated from the race when an oil fire destroyed his engine after the qualifying run. All of the Corsair pilots wore oxygen masks as a precaution against carbon monoxide in the cockpit, since the crash of a similar plane two years ago was ascribed to that cause.

(*Continued on page* 37)

The ill-fated F-51 in which Bill Odom crashed during Thompson. He had previously won Sohio Race in it

Modified *Corsair* F2G-1, a few seconds before Cook Cleland took off to win the Thompson Trophy

Another F2G-1, flown by B. W. McKillen, Jr., won 1st in Tinnerman and 3rd in Thompson races


LEADING-EDGE 3/16 SQ. HARD
SPAR 1/8 x 1/2 HARD
OUTLINES 1/4 SHEET
RIB BLANKS 1/16 MEDIUM SHEET
LEADING-EDGE 3/16 SQUARE HARD
SPAR 1/8 x 1/2 HARD
TRAILING EDGE 1/4 x 1 FORMED STOCK
GUSSET 1/16 HARD STOCK
D.E. FUEL VALVE
CROSSBAR 1/4 x 1/2 HARD
MOTOR-MOUNT
SUGGESTED COWLING FOR GLOW OR IGNITION ENGINE
HEAVY OUTLINE SHOWS KEELS OF 1/8 HARD SHEET
1/8 DOWEL WING-PEG
COWLING-.005 ALUMINUM
1 3/4 NEEDLE-NOSE NOTE ROUNDED POINT
PLANKING OUTLINE 1/8 SOFT SHEET
STRINGERS 1/8 x 1/4 HARD
TIP-RUDDERS 2 OF 1/8 SHEET LAMINATED
RUDDER 1/4 SHEET
DESIGNED AND DRAWN BY KENNETH M. FISHER

Arrow Nut

THE *Arrow-Nut* is unusual among present-day contest models. Most builders will argue for the pylon model, but the close-coupled type of model can be proven more efficient. Several years of experiment with high-powered contest models has carried my designs through a gradual shortening of the wing mount and a corresponding increase in climbing ability. The series began with two identical models, one with an *Orwick*, the other, a Hornet. The *Orwick* job was a sweet flier; the *Hornet* job was too hot to handle. Both ships glided left, but while the *Orwick* job also climbed left at almost any power setting, the *Hornet* produced much different results.

Racing engines only run at two speeds, idling or screaming. At low power, the *Hornet* job behaved like the *Orwick*, but at high power it spun violently to the right. The high wing mount produced a nose-up couple and together with the gyroscopic action of the prop, spinner, and heavy shaft turning at high rpm caused a right turning moment, and a tendency to spin to the right. The other difficulty came from using an engine that had no intermediate running speeds to permit gradual adjustments. I worked the two problems simultaneously. Because of the gyro action I lowered the wing mounts just far enough to leave enough of it to overcome torque.

The one-speed engine, which includes all diesels, and most racing and glow engines, forced me to develop a new method of safely testing a model under full power. That system will be described at the end of this article.

The *Arrow-Nut* is powered with a *Supertigre* .36 diesel. It has terrific power and unusually high speed for a diesel, (9,500 rpm). This power plus the high degree of streamlining make the ship a terrific threat in Class C competition.

Construction is simple and fast. The main plan page is drawn to 1/6 actual scale but all dimensions can be obtained by using the scale on the drawing. All stock sizes are given on the drawings. Wing ribs and fuselage bulkheads are full size.

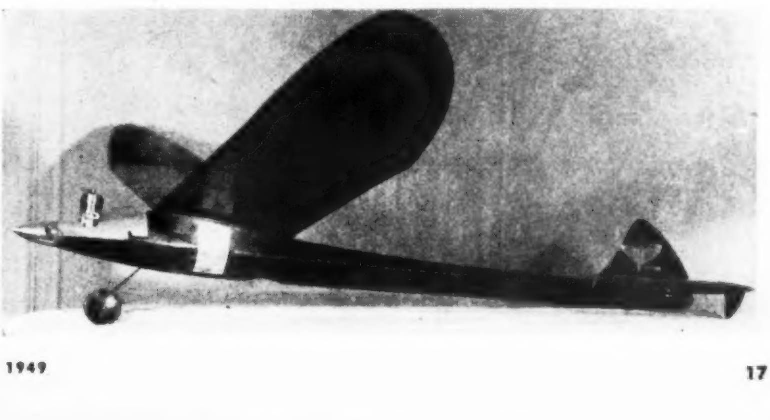
Wing construction is conventional; the only information not on the plan is the dihedral dimension. This is 4-1/2" at the joint and 9" at the tip. The tip spar tapers to 1/4" square at the tip. The airfoil is a 9% clark "Y," with a somewhat sharper leading edge.

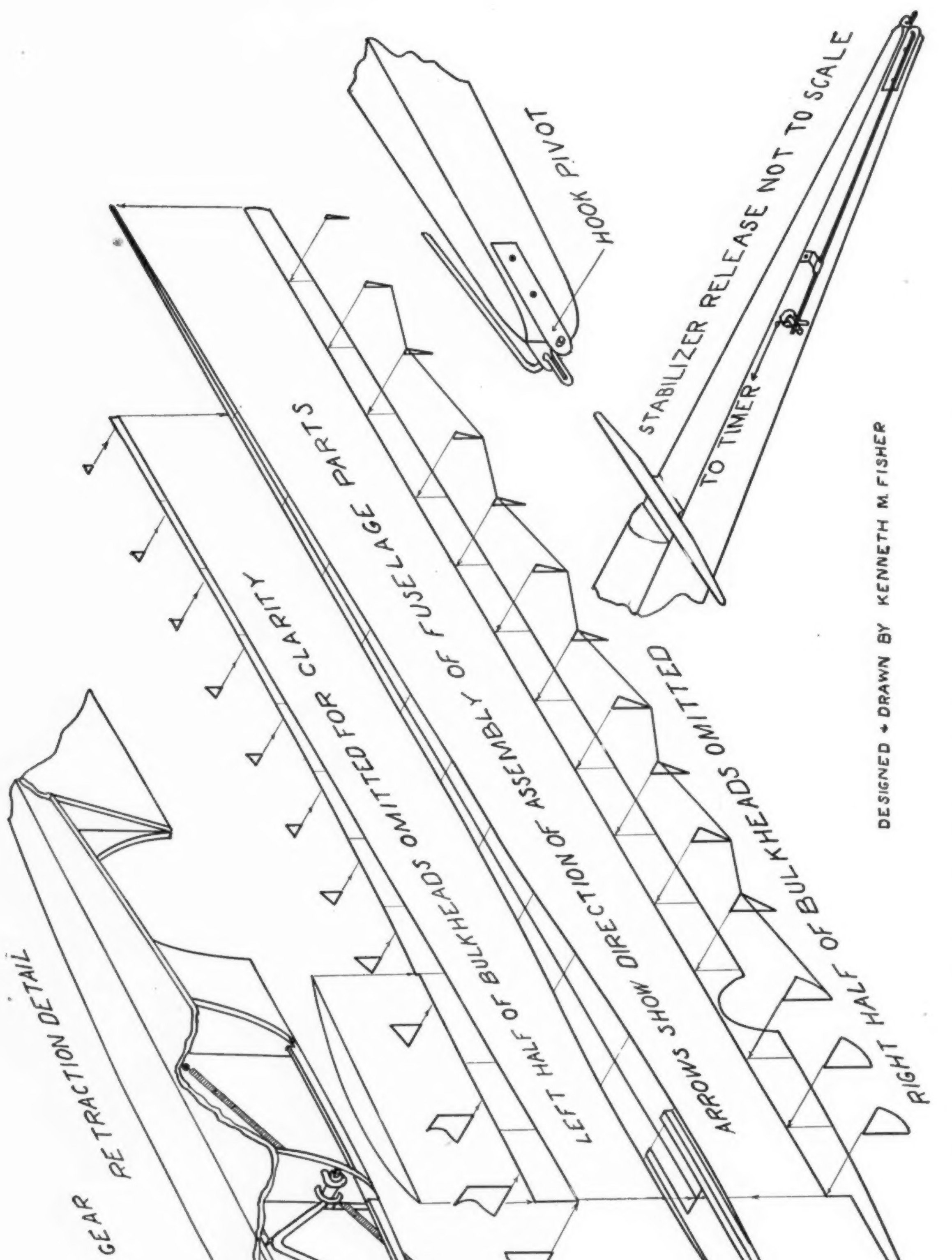
The stabilizer is built like the wing except that rib blanks are used and the airfoil is sanded in after assembly. The spar tapers from 1/4" x 1/2" at center to 1/4" x 1/4" at the tip, and the ribs should be 1/8" higher than the spar at their respective positions. The rudder is cut from sheet balsa and assembled in place after covering the stab.

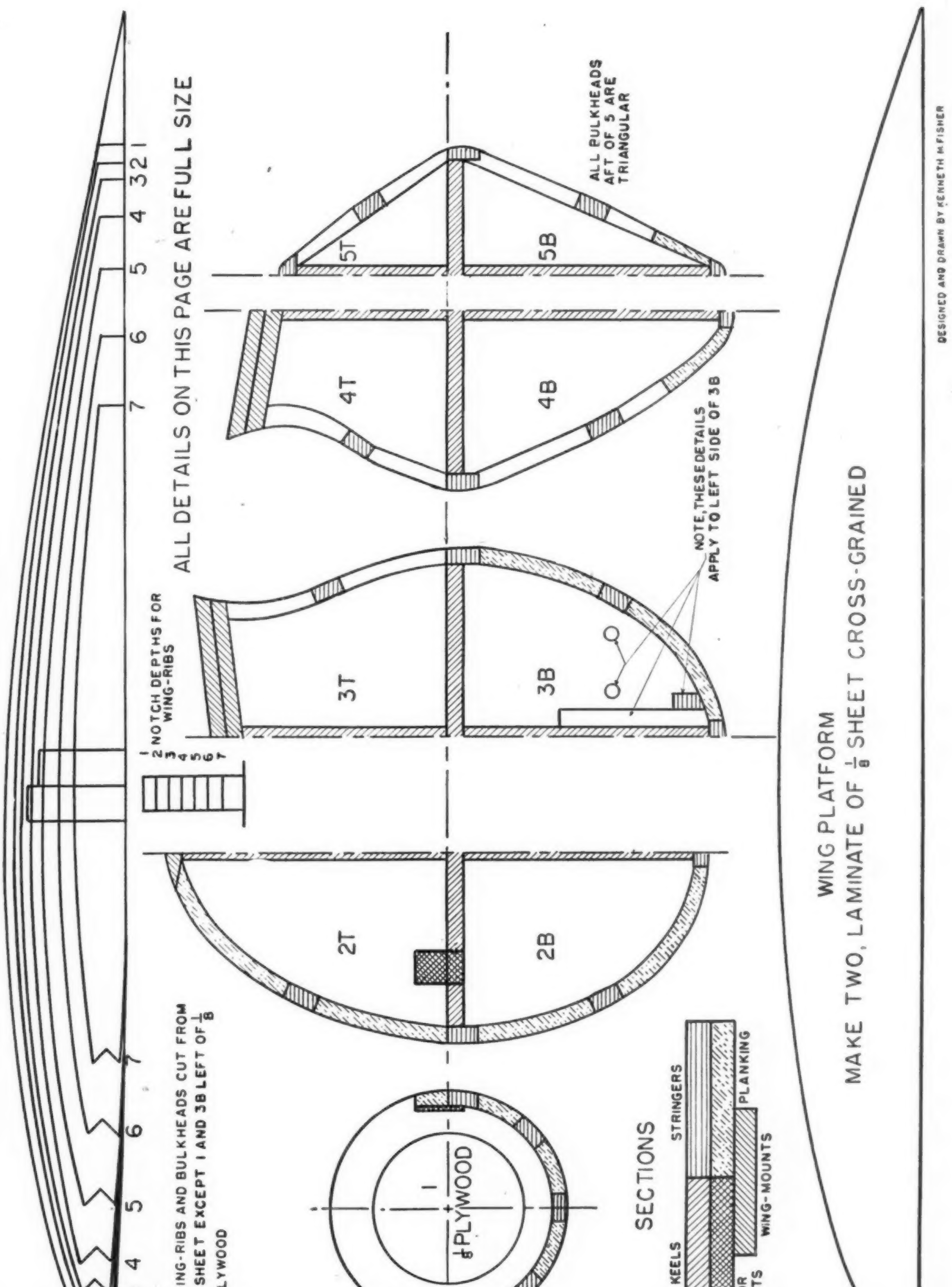
The fuselage is built by joining the horizontal keels and gluing the hard wood motor mounts so that the thrust line will be level with the upper surface of the keel. Next install the vertical keels, bulkheads, and wing mounts. Install the take-off gear on 3B left. It swivels in a tube held by "J" bolts. The coil spring is the type used for belts on movie projectors and can be obtained from any camera repair shop. A plywood stop limits the forward travel of the gear leg. The isometric drawing shows complete installation details. Also, install the D-E valve for the trigger (*Turn to page* 39)

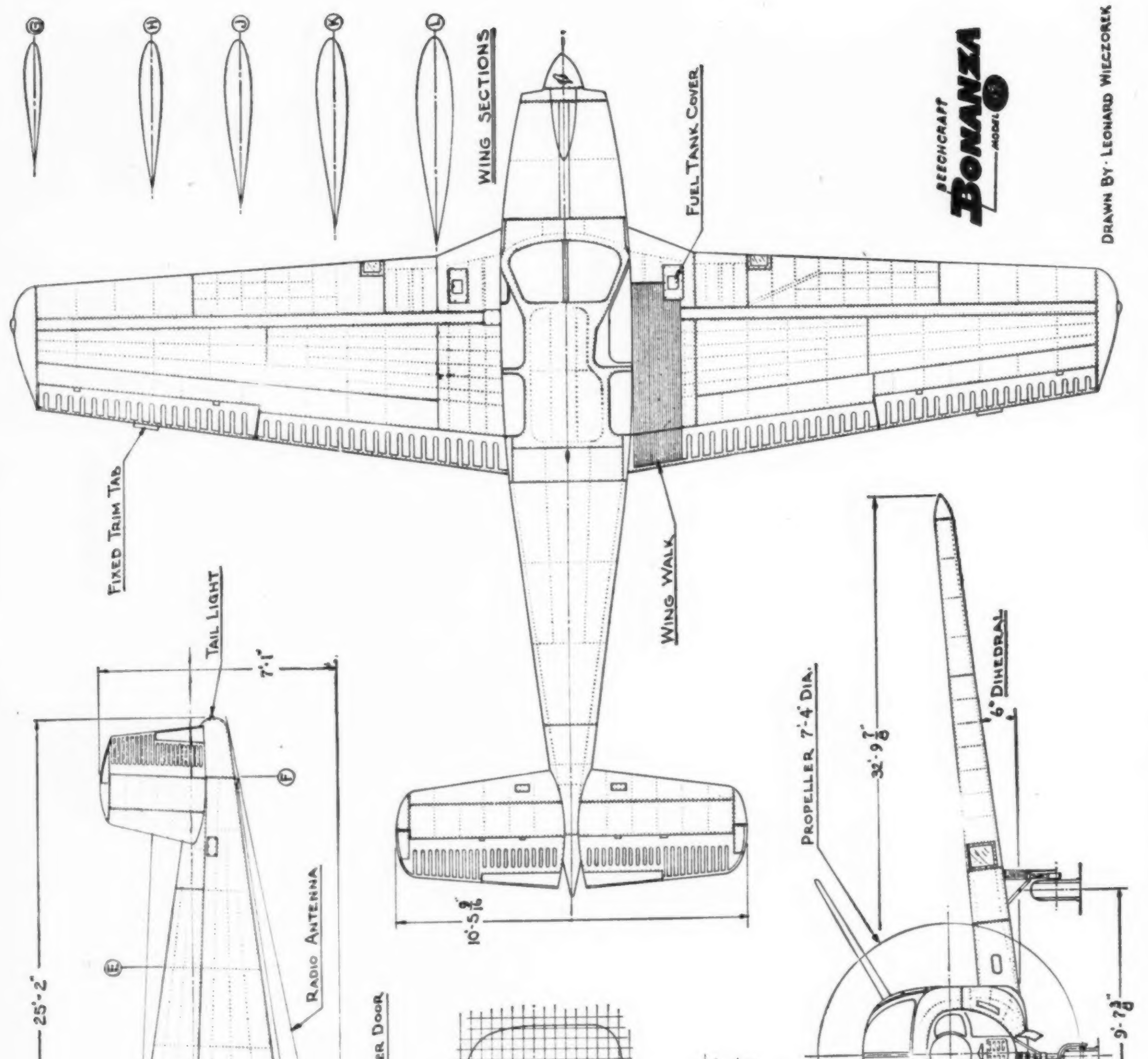
by KENNY FISHER

Though a diesel was used by the author, equivalent gas or glow engines may be used in this contest job

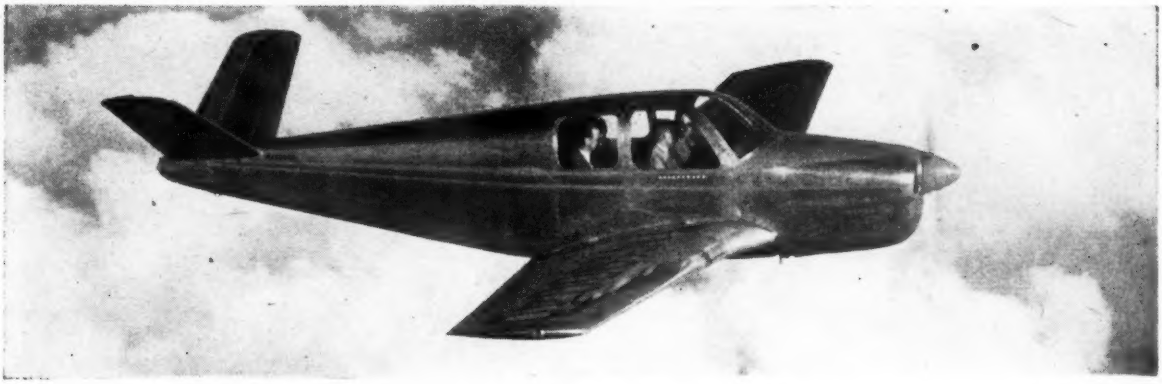



TAKE-OFF GEAR RETRACTION DETAIL
HOOK PIVOT
STABILIZER RELEASE NOT TO SCALE
TO TIMER
LEFT HALF OF BULKHEADS OMITTED FOR CLARITY
ARROWS SHOW DIRECTION OF ASSEMBLY OF FUSELAGE PARTS
RIGHT HALF OF BULKHEADS OMITTED
DESIGNED + DRAWN BY KENNETH M. FISHER


ALL DETAILS ON THIS PAGE ARE FULL SIZE
1 2 3 4 5 6 7
NOTCH DEPTHS FOR WING-RIBS
WING-RIBS AND BULKHEADS CUT FROM 1/8 SHEET EXCEPT 1 AND 3B LEFT OF 1/8 PLYWOOD
1/8 PLYWOOD
2T
2B
3T
3B
4T
4B
5T
5B
NOTE, THESE DETAILS APPLY TO LEFT SIDE OF 3B
ALL BULKHEADS AFT OF 5 ARE TRIANGULAR
SECTIONS
KEELS
STRINGERS
PLANKING
MOTOR MOUNTS
WING-MOUNTS
WING PLATFORM
MAKE TWO, LAMINATE OF 1/8 SHEET CROSS-GRAINED
DESIGNED AND DRAWN BY KENNETH M. FISHER



BEECHCRAFT
BONANZA
MODEL 35
DRAWN BY · LEONARD WIECZOREK
WING SECTIONS
FUEL TANK COVER
FIXED TRIM TAB
WING WALK
TAIL LIGHT
7'-1"
25'-2"
RADIO ANTENNA
HINGED WHEEL COVER DOOR
14°
EXHAUST STACKS
9½" PROPELLER CLEARANCE
6'-6½"
FUSELAGE SECTIONS
10'-5 9/16"
PROPELLER 7'-4" DIA.
32'-9 7/8"
6° DIHEDRAL
9'-7 3/8"
LANDING LIGHT



BEECHCRAFT *bonanza*

by ROBERT McLARREN

"FULL airliner equipment and comfort at lightplane size and cost" is a complete word description of the famed Beech Model 35 *Bonanza*. The pilot of this postwar four-place miniature airliner has at his control all of the standard knobs, gadgets, instruments, and switches of the standard airline transport of the 1933-36 period and yet this is an airplane for the private owner, be he corporate executive on business or just a father and his family on a week-end cruise. If we need look to a single airplane as the yardstick of aeronautical progress in the past 20 years, assuredly that airplane is the Beech *Bonanza!*

Single-engine, low-wing, integral cabin, tricycle landing gear, and "V" tail are the distiguishing features of the trim craft to the airport observer. But high cruising speed with surprising economy, plus plenty of room and comfort, are its distinguishing features to the flying man. The *Bonanza* has a cruising speed of 170 mph at 8,000′ on 115 hp; yet this produces a fuel economy of 19.4 miles per gallon of gasoline, and that compares with the *best* automobiles!

The *Bonanza* gets off the ground, using 10° flap, into a 10 mph wind, in only 665′, and, by lowering the flaps to full deflected position, it lands into that same wind in just 235′. It climbs at 890′ per min. and has a service ceiling of 17,100′. It stalls without flaps at 66 mph but, with flaps lowered, this speed is reduced to only 56 mph. And it can get out there and go, for it has a maximum range at 160 mph at 10,000′ of 750 miles on only 39 gallons and 1,145 miles on 59 gallons. (And if you want *real* range you can install an extra 100-gallon tank in the cabin and two 60-gallon tanks on the wingtips and fly 5,000 miles nonstop as the late Bill Odom did last spring!)

The *Bonanza* has a wingspan of 32′ 10″ and is 25′ 2″ long and 6′ 6½″ high. It has an empty weight of 1580 lbs., and a useful load of 1,070 lbs. gives it a gross weight of 2,650 lbs. With full fuel tanks, it still has 817 lbs. available for people and baggage (or four big 204-pounders with no baggage!).

The cabin is plenty roomy. It is 6′ 11″ long, 3′ 6″ wide and 4′ 2″ high. The passenger door is 36″ by 37″. The baggage door is 24″ by 22″ and the baggage compartment will accommodate 16.5 cubic feet of baggage, or a maximum of 270 lbs.

The *Bonanza* is powered by a six-cylinder Continental E-185-1 engine rated at 165 hp at 2,050 rpm at sea level and 185 hp at 2,300 rpm for take-off, during which this power is drawn for only one minute. The propeller is Beech's own design. It is electrically controllable, has a continuously variable pitch. It is Beech series R-200 with a diameter of 7′ 3″, using a Beech R-900-109 pitch motor and a Beech spinner.

The power plant includes a Delco-Remy starter, Delco-Remy 25-amp generator, Delco-Remy voltage regulator, Cutler-Hammer battery relay, Romec fuel pump, American Air Filter carburetor air filter, Hanlon & Wilson stainless steel mufflers and cabin heaters and Beech's own stainless steel exhaust manifolds.

The two wing tanks of the *Bonanza* have a combined capacity of 39 gallons and an extra 20 gallons can be carried to give a total of 59 gallons, sufficient for well over 1,000 miles of travel. The oil capacity is 10 quarts.

The tricycle landing gear is fully retractable and incorporates several features found only on luxury transports. The nose wheel is swiveling and steerable and is equipped with a shimmy damper. Beech air-oil shock struts are used to withstand the impact of a vertical descent component of over 600′ per minute! The main tires are 6.50 by 8 and the nose wheel tire is 5.00 by 5. Goodyear wheels with single disc hydraulic brakes are used.

The battery has a 25 ampere-hour capacity. Electric motors are used to operate the flaps and to actuate landing gear retraction. Radio equipment includes a transmitter, a receiver for range, broadcast and marker beacon reception, cabin loudspeaker, rotatable aural null loop with orientation dial on instrument panel, and a microphone and headset. An automatic retracting trailing antenna is used, which is paid out as the air speed increases to cruise and is reeled in as the air speed drops to that of final approach. This equipment is standard on the airplane as delivered but any of the special equipment now on the market, such as the new omni-range receiver, etc. can be installed as desired.

The instrument panel is neatly arranged and tastefully

(*Turn to page* 52)

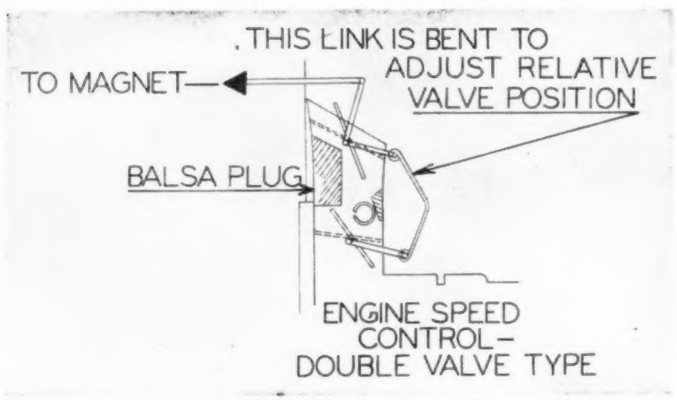


Fig. 1 The "double butterfly" system of speed control as applied to an *Ohlsson* engine

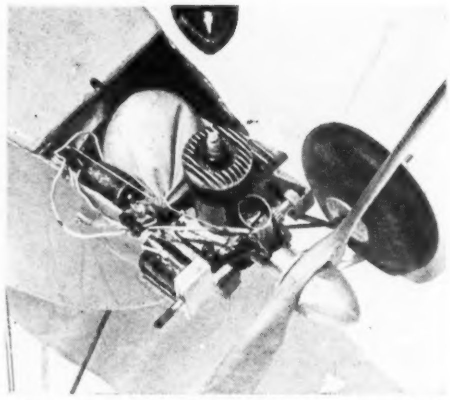


Fig. 2 An early power control system with balloon tank

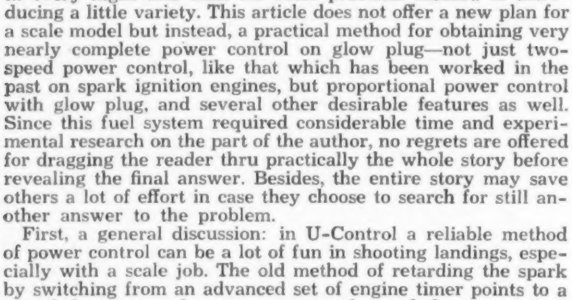
Power Control

PART ONE

DEEP in the mind of every modeler is a desire for realism—otherwise known as scale. Model aviation is primarily a hobby of miniature replicas. Unfortunately, exact replicas do not fly well so we must compromise on the scale appearance in order to gain (or surpass) scale performance. But the desire for realism lingers on. Maybe this article will offer some small measure of relief. It is addressed especially to all U-Control and radio control modelers who tire of the same old pattern in every flight and wish for some practical method of introducing a little variety. This article does not offer a new plan for a scale model but instead, a practical method for obtaining very nearly complete power control on glow plug—not just two-speed power control, like that which has been worked in the past on spark ignition engines, but proportional power control with glow plug, and several other desirable features as well. Since this fuel system required considerable time and experimental research on the part of the author, no regrets are offered for dragging the reader thru practically the whole story before revealing the final answer. Besides, the entire story may save others a lot of effort in case they choose to search for still another answer to the problem.

First, a general discussion: in U-Control a reliable method of power control can be a lot of fun in shooting landings, especially with a scale job. The old method of retarding the spark by switching from an advanced set of engine timer points to a retarded set never became very popular and the reasons are

Fig. 3 Cutaway view of the magnetically operated shut-off valve



understandable. The system gave only two speeds, one at screaming full power, and the other, at some power that was seldom quite right for landing. However, that's all history now. With this new system, any power from idle to full can be selected and held.

Power control is even more useful in radio control. True, it adds equipment to the airplane which requires a little more attention and disagrees with the basic rule of simplicity for radio control. But that simplicity rule is only an order of the day. It is good practice while radio control is new and it is especially useful to the beginner, but it could very easily be overdone. Some of us must stick our necks out and try something new or radio control will never get out of the rudder stage. Then too, this fuel system would not be published if it were thought to be no more reliable than power control was on the old spark ignition engine.

An important use for power control in radio flying is, of course, for touch- and go-landings. This is a realistic maneuver if there ever was one, and requires not only good power control but also some practice. It is not a perfect maneuver today but rather something to strive for in the immediate future. (We are still trying to do a good one at this writing!) A drastic power cut-back is required. These models are pretty efficient in the glide and if just a little power is remaining, that glide is stretched out to almost endless proportions. You would almost have to start the approach to the runway over the next county. Simple escapement operated flaps would help here but it is doubtful if they could be made simple and reliable enough to add more fun rather than just more trouble.

Another important use for power control is automatic altitude control. The power on a model with only single-engine speed must be set very low for a very important reason. The ship must be able to take off and climb to a safe altitude for maneuvering, but this fixed rate of climb goes on and on and on. In a matter of only a few minutes, even a large model can become a mere speck in the sky, unless considerable attention is paid to keeping it down. It is no wonder that large models are advocated. A small one would be out of sight when less than a mile away. Spiraling the ship down with rudder is possible but not entirely satisfactory. The spiral always builds up speed. Upon recovery, the model (unless handled very skillfully) will usually zoom back up almost to where it started. Then the spiral process must be started all over again. In the meantime the ship has no doubt drifted down wind. By the time it is flown back over head it may well be up to that high altitude again. Single-speed engine is a good idea when one is getting acquainted with radio control flying, and it is not a bad idea even for the initiated while the art is so new. However, let us hope that two years from now it will be largely a thing of the past—at least on an expert's model.

To consider the advantages of power control as an automatic altitude control, let's assume just a simple two-speed engine and then the advantages of a multi-speed engine will be obvious. With two-speed, the model can take off and climb rapidly to a safe altitude for maneuvering. Then, with power cut-back, it is a simple matter to keep the ship close in where both pilot and spectator can enjoy the fun. At reduced power, the ship

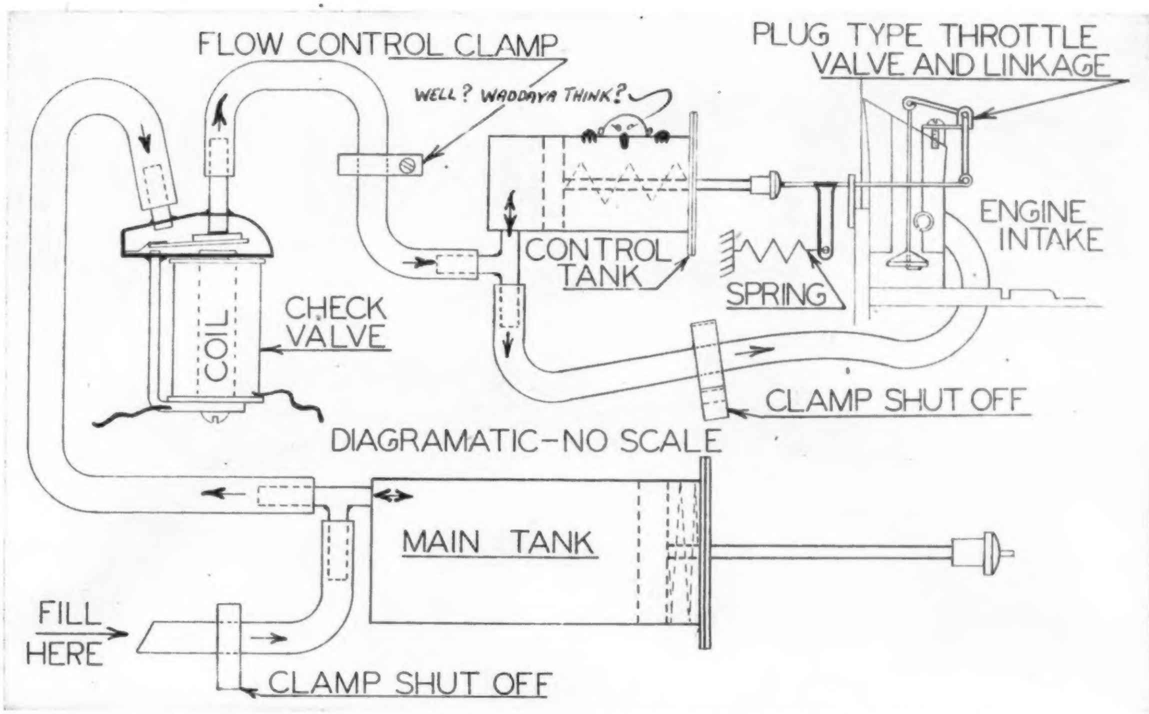


Fig. 4 The complete control system, arranged for use in a radio control plane. The various elements can be shuffled for different purposes

by H. H. OWBRIDGE

has either a very slow rate of climb or a very slow sinking speed. It is almost impossible to get that reduced rpm setting right on the button. If the ship still tends to climb away, holding a turn a little longer will cause it to lose altitude gently. If the ship tends to sink, a little full power now and then will keep it up there. While if the power setting is just right, the ship, if left alone in its large natural circle, will soon find its service ceiling and (assuming thermals are not too strong or numerous) never go any higher.

This last power setting is very difficult to find so a multi-speed power control is even a better solution. There are other ways to obtain altitude control. The Army uses only single-engine speed in their target ships but they have a trimable elevator. A short pull or push on the ground control stick moves the elevator up or down just a little and it stays there until signaled to move again. This type of control requires audio tone signals and electric motors, hence it is not so well suited to the hobby field. George Trammell has a very good proportional elevator control that installs in the ship for very little weight but it takes a separate transmitter and receiver to operate it. The least expensive method of altitude control appears to be in the field of power control.

An important part of the engine control subject is engine cut-off. If it can be had cheaply enough, it is well worth it. At present, radio control jobs are carrying a fuel supply that will run the engine from 6 to 12 min. The occasion often arises when it is desirable to terminate a flight before the fuel runs out. It is tough to be caught with a 10-minute fuel supply and not be able to stop that motor from churning away. Consequently, cut-off by remote control can come in handy.

But suppose you have lost radio contact with the ship. This means that your cut-off is useless and the ship could fly away with some 10 minutes' fuel aboard. The ship can be followed and found although it would be better if we had an emergency runaway cut-off, providing it doesn't cost too much in weight and complexity. This has been accounted for in the new fuel system. A quick cut-off should be considered too. At that all-important moment when launching a new ship (we don't free flight them without radio anymore) it would be nice to have a quick cut-off in case the ship showed spiral tendencies. So there are really three kinds of cut-off that are desirable. Let's refer to them as normal cut-off, runaway cut-off and crash *cut-off*. We feel their importance is in the order listed. Normal cut-off is most useful and simply operates when signaled for. Runaway cut-off is less important because we have never had it before and we have never lost a ship. But we have done some nice chasing and since runaway cut-off should at least reduce this chasing and since we get the cut-off free, we gladly accept it. Crash cut-off is least important because it is only useful when launching a new ship. Once the ship is proven airworthy, crash cut-off is seldom needed again. We have had a quick crash cut-off in the past and found that it takes unusually quick action and a lot of luck to get that engine stopped in time to save the ship.

We have found that in launching a new ship, it is better to install the radio control complete, make sure the ship is trimmed straight and has no warped surfaces and that the C.G. is about normal or a little forward and that everything is working well at a distance from the transmitter. Then we launch it. If it shows a spiral tendency (and they have), it is just a matter of keeping cool or at least cool enough to fight the spiral until the ship is safely on the ground. If you lose the battle, there is always the glue pot.

Just how much equipment it will take to get all these cut-offs and power control depends on how it is done. There is one way to get such control and still keep the amount of equipment down to reasonable weight and complexity. This way is to have one part serve at least two or more purposes. That's the way it is with this fuel system. Power control is the major issue but normal cut-off and runaway cut-off are obtained as by-products at no extra cost. It would take extra equipment to get crash cut-off, so we would rather do without it.

There are three other problems which the reader should be reminded of before we go on. One is the problem of getting all this power control on a single radio frequency channel because it seems likely that only single channel equipment can become popular in the future. The second problem is related to the first. It would be better to have our control available on the simple cyclic type of escapement control because this type will always give the most control for the least weight. But in a cyclic system in which all controls must be passed through whether they are wanted or not, we must have a time delay so that we can avoid a power change and thus keep the power control separated from the aerodynamic control. This also is inherent in the fuel system to be described. The third problem has been with us for a long time and becomes apparent almost every time we try a violent maneuver. This is the problem of momentary air pick-up in the fuel line when this line becomes uncovered in the fuel tank. There is often air in the fuel line, but if the amount becomes too great it will stop the engine. Many tank shapes have been tried to avoid this. Those who do not have trouble simply don't do violent maneuvers. The elimination of this problem is another one of the extra features that are inherent in our fuel system. (*Continued on page 46*)

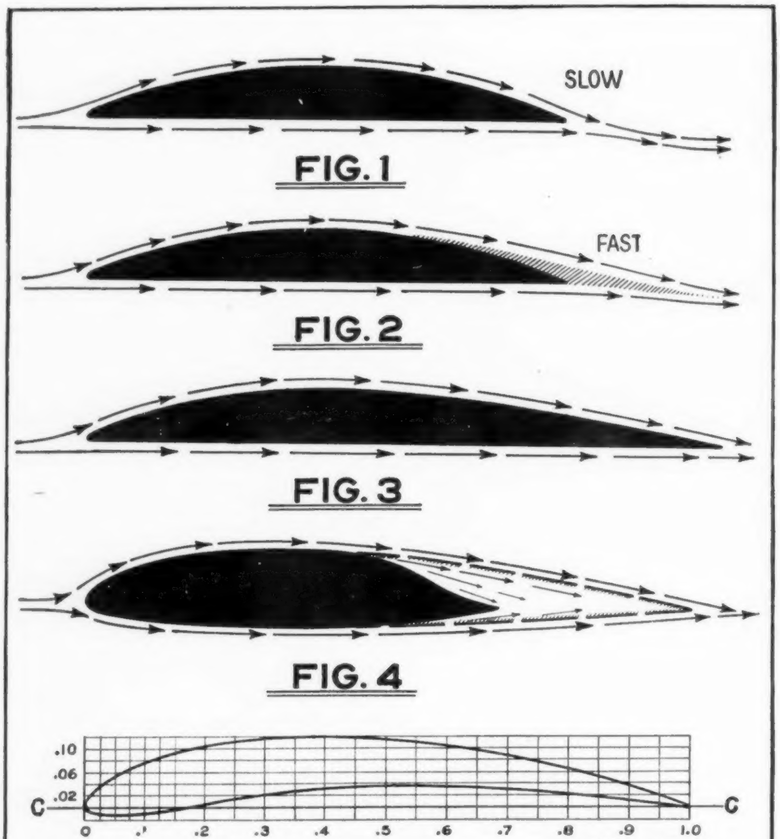


FIG. 1
FIG. 2
FIG. 3
FIG. 4
FIG. 5
FIG. 6

design forum

by CHARLES H. GRANT

EVERY model designer apparently has his pet wing section, the form of which may be dictated purely by fancy or occasionally by serious consideration. Some merely draw out a wing section according to their particular ideas of what it should be; others study all available data on full scale wing sections that they can obtain, usually selecting a section that provides the greatest lift-drag ratio as indicated by the accompanying data.

Desire for increased flight efficiency and to win flying contests have inspired model builders to go to great lengths in this respect. However, on many occasions to the chagrin of those who have put hours of study on selecting their wing sections, some other flier's model wins the contest. This model, you learn later, had a wing with some nondescript and haphazard wing section. Only too often you attribute the success of the flight upon the caprice of a thermal, or good fortune in adjustment. Actually some mysterious and allusive characteristic of a particular wing may have provided the excellent performance.

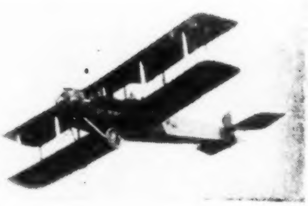
Some of you have reasoned that if a wing section of a full scale airplane gives super-efficiency, it should also bestow similar characteristics upon your model. Results of use of these fine wing sections have only added to the confusion of thought concerning this matter. Possibly some of you have tried the old trick of placing your wing on your model in a reversed position, with the trailing edge serving as the leading edge. If your model is light and flies comparatively slowly, you have been still further confused by the fact that it glides as well with the wing in the reversed position as it does with a normal wing setting. This seems to explode all of the theories concerning the value of particular wing sections. If you have reached this stage, you are so utterly confused that you are ready to throw all ideas of wing sections to the winds and either copy the wings of contest winning planes, or draw up *just any old section* for your contest job.

Perhaps someone tells you that the secret lies in the Reynolds Number and usually goes no further. The Reynolds Number might as well be the ghost of your grandfather as far as being a practical help is concerned. Even if you do know what it is in technical terms, it is still valueless . . . valueless because it must be applied properly to be of any service. So the Reynolds Number itself is not important, but rather its application, or shall we say complete understanding of the principles involved and how to apply them.

The difference in wing performance between full scale airplanes and models gives an excellent example of Reynolds Number effect. Another excellent example is the difference in the effect of the wing on flight efficiency between comparatively heavy gas models and indoor models. The latter type give far greater duration than the average gas model, yet their wings are merely a shallow arc of a circle, usually constructed with exposed spars without any attempt on the part of the builder to provide a so-called efficient wing section. We can reach one accurate conclusion concerning wing sections from these examples; namely, the slower that an airplane flies the less important the form of the wing section becomes. Butterflies fly efficiently with perfectly flat wings while the book tells you that flat surfaces are highly inefficient. They fail to add, however, that flat surfaces are inefficient at higher Reynolds Numbers. A butterfly's wing has a very low Reynolds Number, approximately 500 to 1,000. Reynolds Numbers of full scale aircraft range from one million to ten million. So the question is—What type of wing section is best for any particular model and what influences the design of wing sections for models, as compared to large airplanes? It is not enough to say that the answer is the Reynolds Number. It is necessary to know what the Reynolds Number represents and how it effects flight. To give you a purely mathematical analysis is not sufficient for complete understanding. We will try to explain it here in regard to its effect so that you can understand the principles and use them in your own way.

Actually the Reynolds Number indicates the numerical effect of air flow around objects passing through the air, when these objects have a difference in speed, a difference in lineal dimensions, and when the air has a difference in density, and/or viscosity. Suppose we look at Fig. 1 which shows a wing section curved in a simple arc. At a particular speed the air flows around this section as indicated. For example,

(*Turn to page* 48)



WORLD WAR I

Part Two

Salmson 2A.2 with American insignia pictured in France; radiator shutter details are clear

by ROBERT C. HARE

Recently, these pages contained a design description together with performance figures and principal dimensions of the famous French two-seater of World War I, the Salmson 2A.2.

It is evident from the design discussion that the final configuration and superior performance of the 2A.2 depended a great deal on the engine fitted. This engine, the Salmson 9Z, was inspired by the compactness, light weight and excellent weight distribution afforded by contemporary rotary engines. But the 9Z was water-cooled. Its nine cylinders were arranged like any other air-cooled engine. Bore was 125 mm., and stroke 170 mm.; valves were operated by shafts and rocker arms. Pistons were cast aluminum. Cylinders were made of steel with welded water jackets. Water was cooled by a circular radiator mounted in front of the cylinders surrounding the propeller end of the crankshaft.

Exhaust was collected by nine tubes and led to a circular collector ring fitted around the radiator. This eliminated the usual series of exhaust outlets associated with a water-cooled engine and their attendant resistance. The exhaust collector ring has only two short streamlined-section outlets. A peculiar radiator shutter arrangement completed the engine section of the 2A.2. It consisted of a series of radial, venetian-blind-like metal blades opening to catch the propeller blast. The shutters were attached to a narrow ring which was in turn fastened to the exhaust collector.

The engine was mounted to the fuselage by means of a "spider" built up of steel plates and steel "I" beams attached to the longerons. Balance of the engine section consisted of a four-piece sheet aluminum cowl fitting over the cylinder heads. This cowl was equipped with formed "bumps" to allow movement of the rocker arms, and louvers to assist in cylinder head cooling, accentuating the compactness of the arrangement. Carburetor air intake was accomplished through a scoop attached to the bottom section of this cowl.

FUSELAGE STRUCTURE. The fuselage proper began where the longerons were attached to the engine mounting spider. The four main longerons, forming a basic box structure, were made of spruce. The lower members were in the form of "I" beams in their forward lengths, and were spliced into square sectioned lengths just behind the observer's cockpit.

Vertical uprights and horizontal crosspieces were of the same material, cross-braced with solid steel wire. The round aspect of the fuselage sides was achieved by the use of heavy plywood formers in the forward section and light formers aft. All formers were perforated to save weight, and those aft were scalloped between stringer slots to prevent their protruding through the fabric covering.

Sheet metal was used to cover the fuselage forward of a point midway between the lower wings and the engine cowl, except for a section in that area below the center line of the fuselage, which was fabric covered. Six stringers on each side gradually faired the roundness into a vertical knife edge at the sternpost.

Bottom of the fuselage was flat except for a metal fairing and cowl under the engine section. Upper surface was rounded the entire length of the fuselage.

The fuselage generally was a maze of structural parts which contrasted to the usually simple structures of World War I aircraft. But the fuselage was also spacious as far as observer and pilot were concerned, and contained an unusual assortment of instruments and equipment.

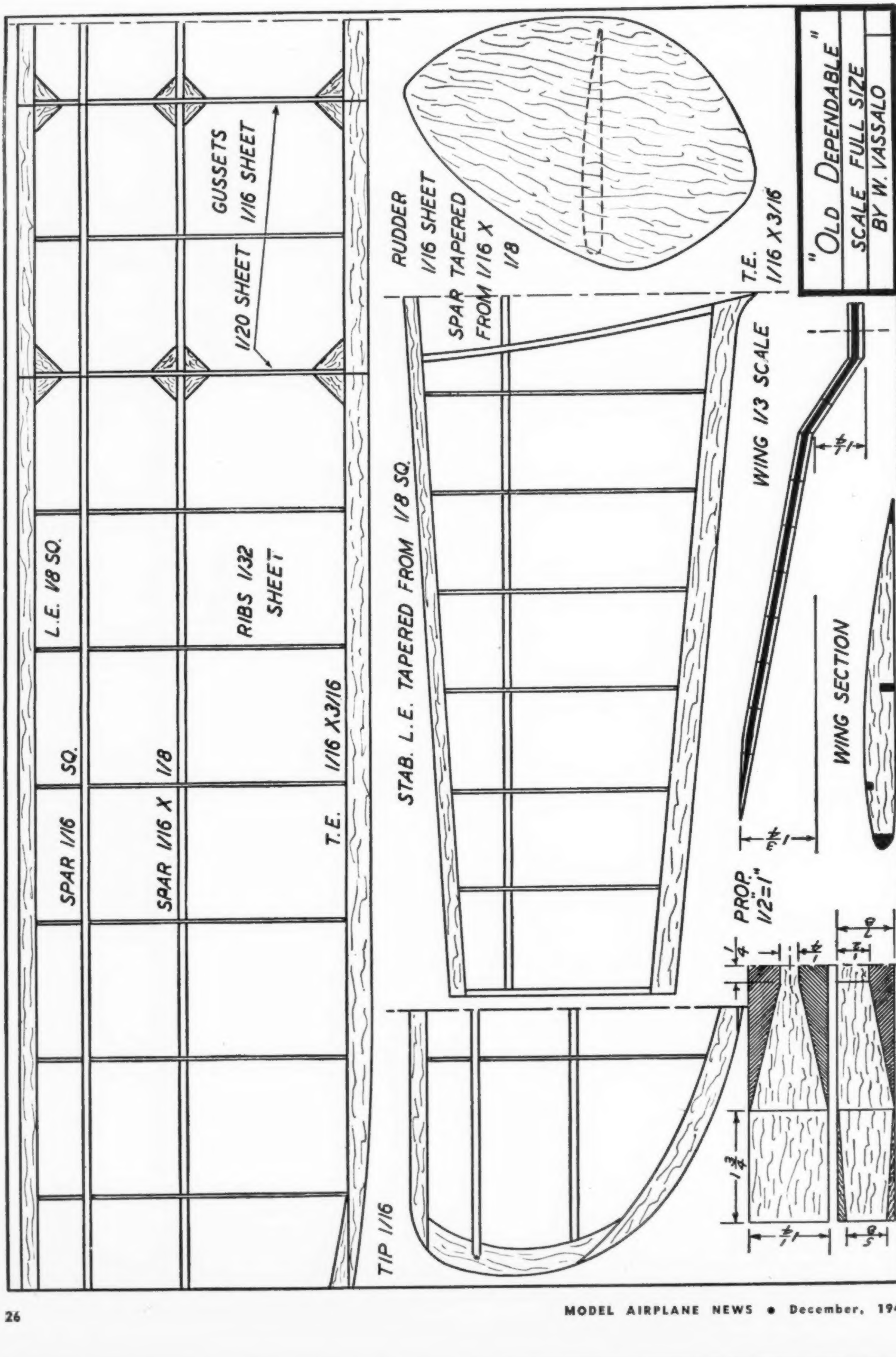
The pilot's cockpit was well forward so he sat with the leading edge of the upper wing directly above his head. Immediately in front of him and to the left of the center line was a single Vickers synchronized machine gun, the plane's only forward armament. The cockpit was deep and provided excellent protection against the elements. Lack of a firewall kept the pilot's pit uncomfortably warm, and in late models the 2A.2 was equipped with cockpit ventilators.

In addition to cockpit lights for night flying, the pilot was equipped with a complete set of instruments. Entrance and exit to the cockpit was aided by a hinged windshield which could be swung forward out of the way.

Resting on upper longeron braces immediately behind the pilot was an auxiliary fuel tank of 45 litres capacity, and

(*Turn to page* 36)

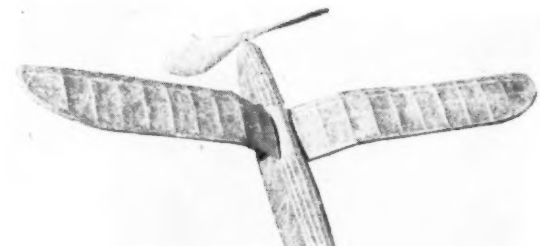
A 2A.2 completely armed and ready to go. This is also a U.S. ship

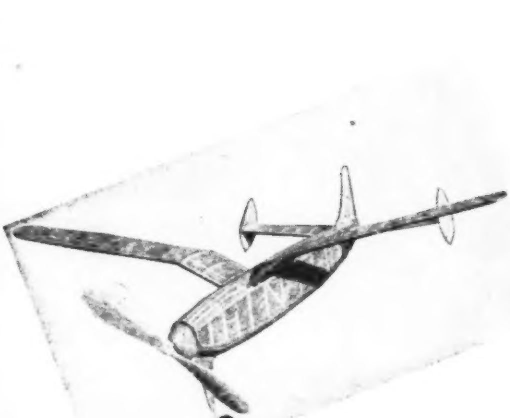


"OLD DEPENDABLE"
SCALE FULL SIZE
BY W. VASSALO
GUSSETS 1/16 SHEET
1/20 SHEET
L.E. 1/8 SQ.
RIBS 1/32 SHEET
SPAR 1/16 SQ.
SPAR 1/16 X 1/8
T.E. 1/16 X3/16
TIP 1/16
STAB. L.E. TAPERED FROM 1/8 SQ.
RUDDER 1/16 SHEET
SPAR TAPERED FROM 1/16 X 1/8
T.E. 1/16 X 3/16
WING 1/3 SCALE
WING SECTION
PROP. 1/2"=1"

by WILLIAM VASSALO

Old Dependable





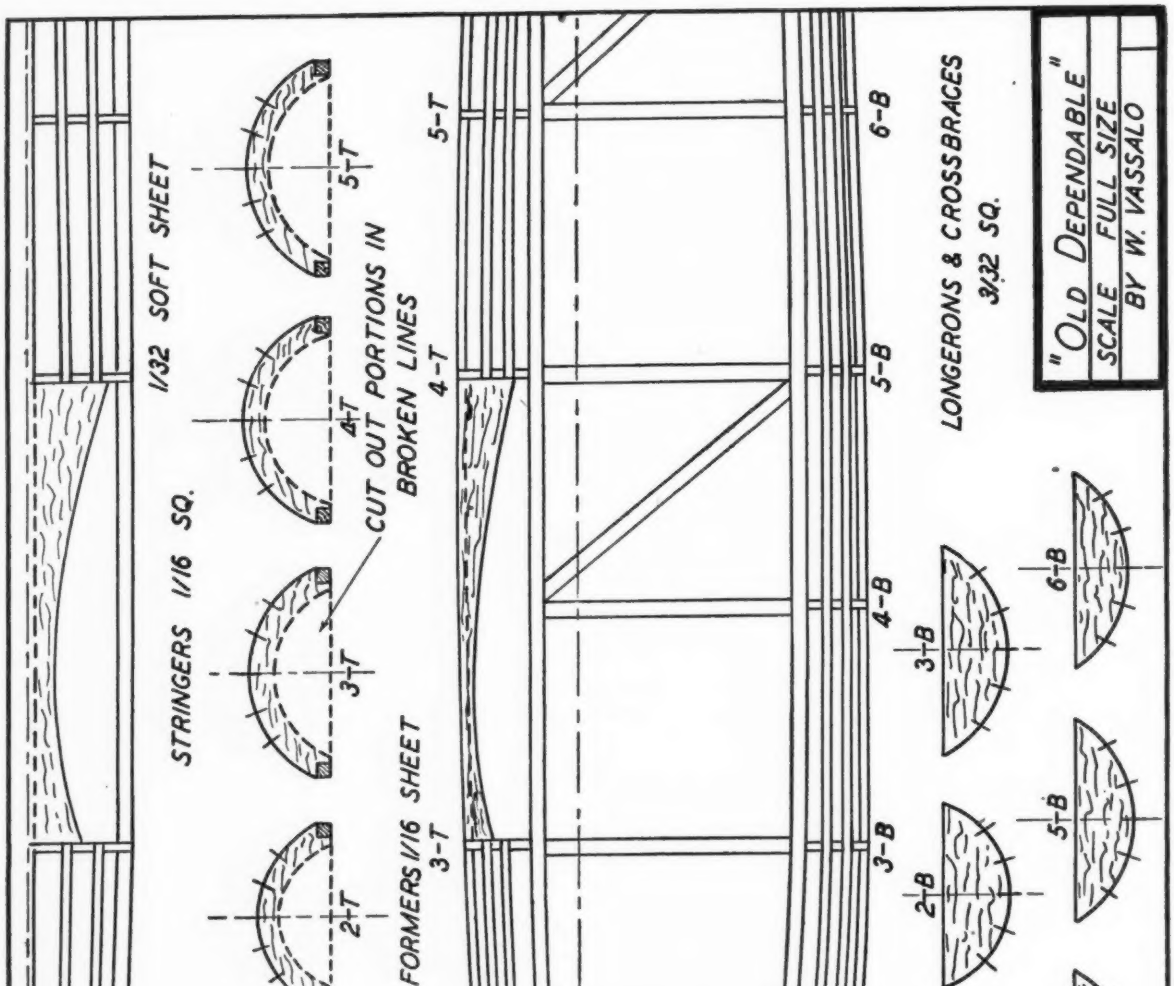
QUITE a number of years ago my folks took me to the seashore with them for a week-end holiday. As I was basking in the radiant rays of the sun on the beach, a few sea gulls happened along, floating and gliding in all sorts of maneuvers. After watching them with keen interest for some time, I began to visualize a model incorporating a gull-shaped wing which would possess soaring possibilities comparable to that of its bird ancestors. Even at that early stage of development the modeling bug had bitten me rather deeply, so long before the week end was over I had already started to dissipate my holiday by spending most of my time drawing sketches of the proposed design. And since the ways of most builders have been found to be universal, soon after we arrived home, I immediately started work on the project. Sad to relate, however, the ship did not come anywhere near to the performance of the gulls I had seen on the beach that day. Since that time, gull wing designs have always fascinated me and down through the years all types of gull wings have been built and flown. It can be safely said that these later designs have really proved their worth many times over.

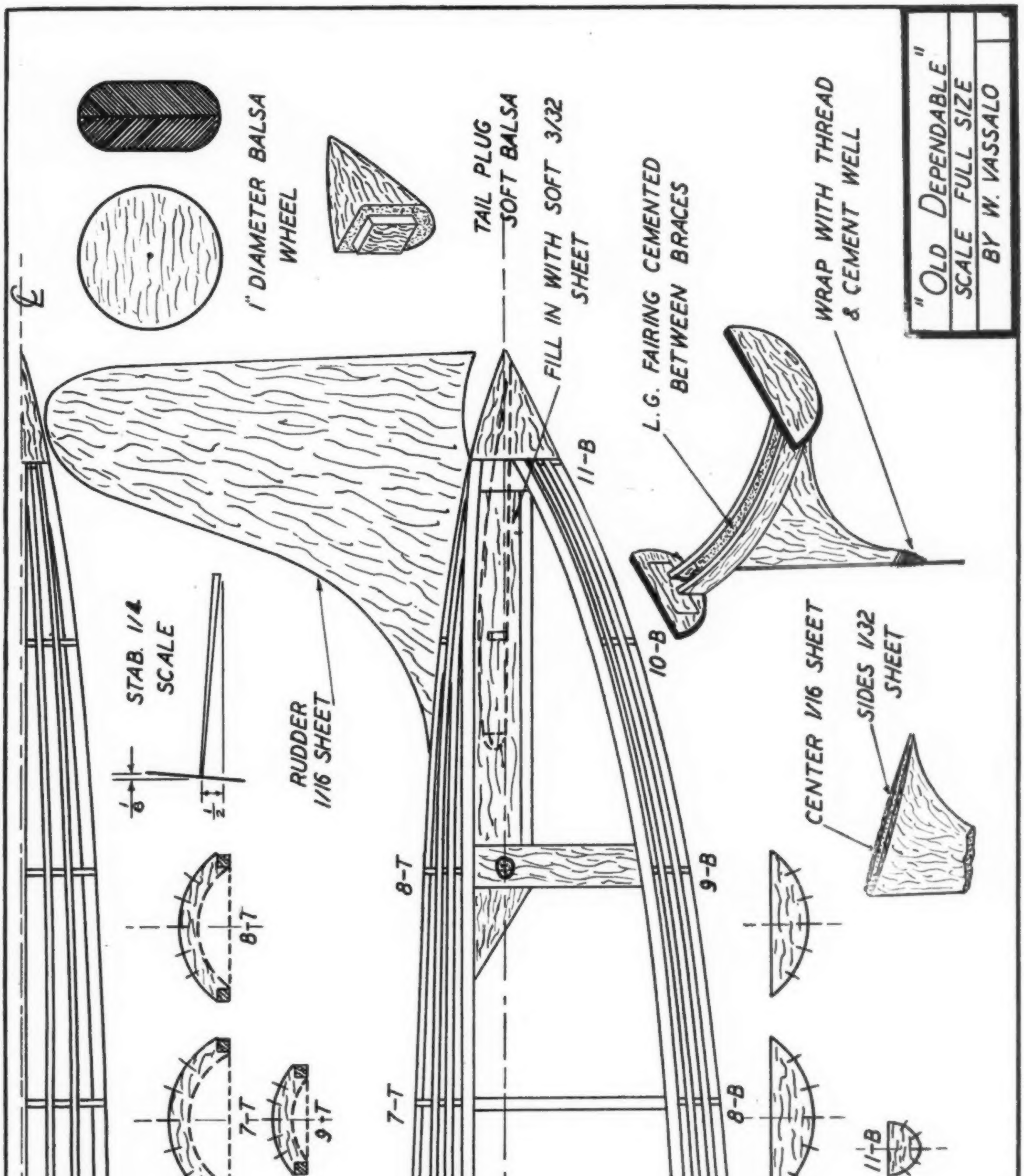
"Old Dependable" is a continuation of this perpetual series and has performed equally as well if not better than previous gull wing designs. The test model was conceived during the height of the hard winter of 1947-48. Those of you who live in the northeastern part of the country will recall that winter was one that will long be remembered; the ship could only be tested sporadically. High as the snowdrifts were in places, I managed to test the ship rather thoroughly by the time the winter was over; and since then a great many changes have been made in the original layout. The net result is the ship presented here.

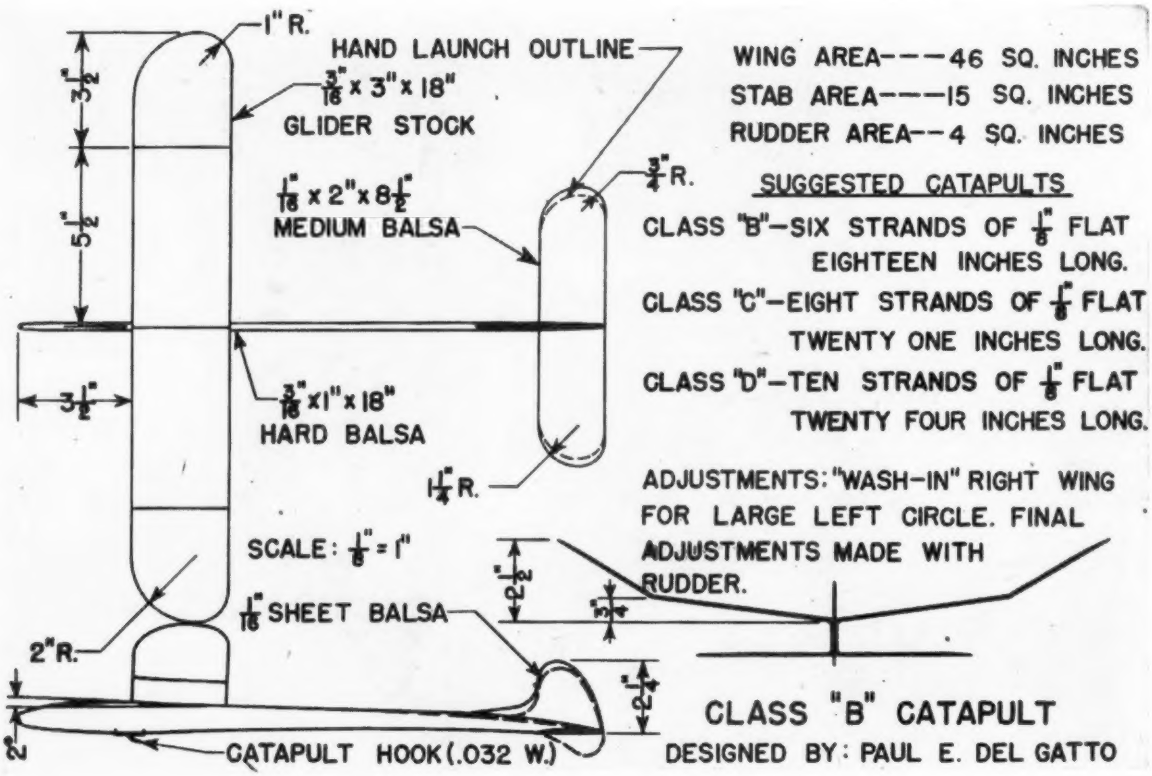
While construction has been made rather simple, the model still retains all the contours necessary to make it an attractive project for the beginner or the contest flier. Under power it is a steady, smooth flying job fully capable of attaining great height for those long sought glides. Its glide is fast, but couldn't be flatter, therefore I suggest taking track shoes with you to the flying field.

Follow the instructions closely being certain to keep weight to a minimum through careful selection of material. I know most of you by this time are getting fidgety for those fragrant workshop aromas, so let's start on a model that can be depended on to give fine flights.

To begin construction of the fuselage, select two firm lengths of 3/32" square balsa and lay them down over the side outlines, one over each longeron. Using the same size (*Turn to page 42*)


"OLD DEPENDABLE"
SCALE FULL SIZE
BY W. VASSALO
LONGERONS & CROSSBRACES
3/32 SQ.
STRINGERS 1/16 SQ.
1/32 SOFT SHEET
CUT OUT PORTIONS IN
BROKEN LINES
ALL FORMERS 1/16 SHEET
NOSE BLOCK
TIN
FITTINGS
.034 WIRE
1-T
2-T
3-T
4-T
5-T
1-B
2-B
3-B
4-B
5-B
6-B


"OLD DEPENDABLE"
SCALE FULL SIZE
BY W. VASSALO
WRAP WITH THREAD & CEMENT WELL
L.G. FAIRING CEMENTED BETWEEN BRACES
FILL IN WITH SOFT 3/32 SHEET
TAIL PLUG SOFT BALSA
1" DIAMETER BALSA WHEEL
STAB. 1/4 SCALE
RUDDER 1/16 SHEET
CENTER 1/16 SHEET
SIDES 1/32 SHEET
6-T
7-T
8-T
9-T
7-B
8-B
9-B
10-B
11-B



The H-L Glider Question

by PAUL DEL GATTO

FOR the past few years there has been a great deal of discussion with respect to the hand-launch glider rules. Many model builders, perhaps the majority of them, feel that they are handicapped in a hand-launch glider event. The reason being, that their launching ability may be only average, or even below average. Therefore, many shy away from this event, even if they feel that they could design a superior glider than some other modeler, whose throwing ability is above average.

The average modeler has great difficulty trying to obtain 75' of altitude with a hand-launch glider of approximately 40 sq. in. of wing area. Yet, there are a few model builders who can get upwards of 100' with a glider of the same wing area. This naturally raises the odds against the average modeler to astronomical heights, not only because of the increased altitude, but also because of the increased chances of soaring into thermal activity. During a contest, the deciding factor will not be in favor of the model builder with the best design, but rather with the model builder who has the best throwing arm.

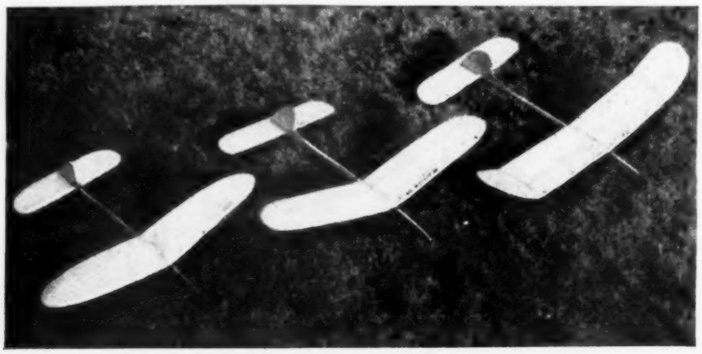
The photographs shown herein represent my own venture into large size outdoor hand-launch gliders. All of these gliders consistently turn in times of over one minute.

The designs are not so radical that we could say they have superior performance characteristics over other glider designs. Then what are the contributing factors in order of their importance which produces such excellent times? The first would be the comparatively high altitude obtained with all three designs. The Class B design has a projected wing area of approximately 65 sq. in., and can be launched by the author to a height of 90 to 100'. Second, is the Class C design with a projected wing area of approximately 102 sq. in. This has been launched to an altitude of approximately 80'.

The Class D design with a wing area of approximately 155 sq. in. is the most difficult to launch, the maximum altitude obtained with this design being approximately 70'. This may not seem very high,

(*Turn to page* 62)

The author with one of his big gliders



Some variations of big gliders suitable for catapult launching

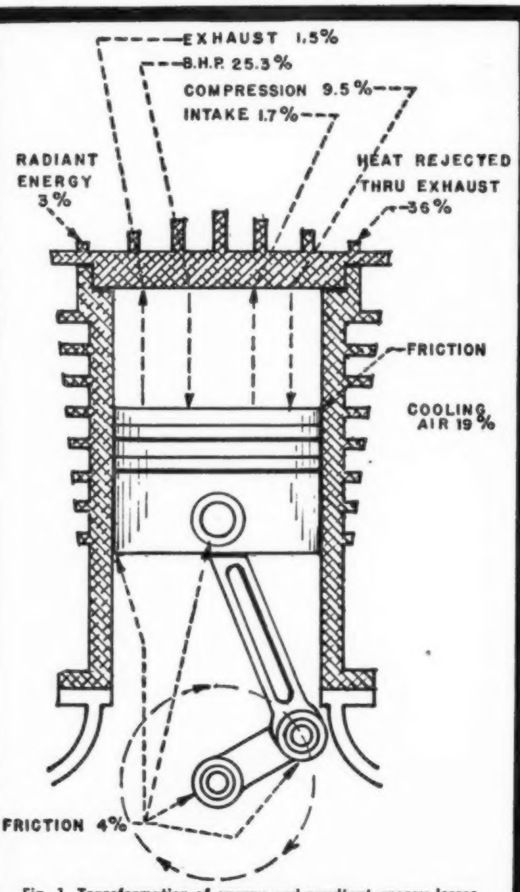


Fig. 1 Transformation of energy and resultant energy losses

by WILLIS L. NYE

GENERAL. This discussion is a brief review of the fundamentals of engine cooling. Most of the racing fliers usually have success in obtaining the maximum output from model engines, but at times are prone to overlook some of the principles of engine cooling. It is manifest from the theory of engine operation that the heat developed by an internal combustion engine is a function of engine design, and the ability of that engine design to transform heat energy supplied by the fuel into mechanical energy during the combustive process. It is evident that heat lost through the engine exhaust and cooling media represents a high percentage of mechanical energy loss. Refer to Fig. 1. This illustration shows that heat energy is dissipated in several ways, and that the mechanical energy which is retained and converted to useful mechanical effort is relatively low in comparison with the heat losses.

While an engine may be operated at maximum power for limited duration, it is imperative that it be protected from the ravages of excessive operating temperatures which interfere with the movement of reciprocating parts and thus cause destructive deterioration of the metal parts. In short, engines must have means for the dissipation of heat developed in the combustion chamber of the cylinder where high temperatures prevail. Engine parts subjected to intense heat are the cylinder head, the piston, and to a large extent the cylinder walls, in the order named. Connecting rod bearings also develop high temperatures during prolonged operation because of the frictional contact and the proximity to the combustion chamber.

MAXIMUM HEAT OF FUEL COMBUSTION AND THE TEMPERATURE OF THE COOLING AIR. Model airplane engines are designed to be cooled by air which is referred to as direct cooling. Air cooled engines do not require a heat exchanger system to reject the heat. Laboratory tests indicate that not more than 19% of the heat developed during engine operation can be conducted away or rejected by direct cooling methods. Thus it is obvious that only a slight reduction in engine cooling performance will cause improper engine operation and may also ruin a high-speed engine. The dissipation of the heat by the cylinder head is the major limiting factor of engine design.

The maximum temperature of fuel combustion gases may be 3,300 to 3,400° F. It will rarely be less than 3,000° F.; the difference in the temperature range is a function of the heat units contained in each ounce of fuel burned in a specific time in the engine. The temperature of the combustion chamber walls will be in the range of 500° F. The outside surface of the cylinder will be less than the wall temperature, and by means of this difference, a rapid conduction of the engine heat from the combustion chamber walls through the metal of the exterior surface

engine cooling

by WILLIS L. NYE

Does your engine overheat? Read why here

of the cylinder is possible. The air stream flowing over and around the cylinder head will transfer the heat to the atmosphere.

The heat developed by combustion of the fuel is absorbed by the air through the phenomenon of convection. The rate of heat dissipation with direct cooling can only be improved by an increase in the velocity of the air flowing over and around the cylinder at a specific atmospheric temperature at standard density and normal humidity. It will also be improved on those periods of operation where outside air temperature is low.

THE RATE OF HEAT REJECTION BY THE ENGINE. The quantity of heat rejected by the engine and radiated to the atmosphere is a function of the air mass circulation over the cylinder head, and also the conductivity of the metallic alloy from which the cylinder head has been fabricated. Air circulation depends upon the velocity of the air stream and the amount of finned cylinder head area over which it circulates.

The actual air stream velocity is a function of the model plane airspeed. In order to maintain a cylinder wall temperature not in excess of 500° F., or less, it will be necessary to provide sufficient heat radiation area in the form of fins on the cylinder head and engine crankcase which will be in excess of the heated area of the internal cylinder wall. To assist the radiation of heat, the cooling flanges should be tapered in cross section so that the heat may be more rapidly dissipated.

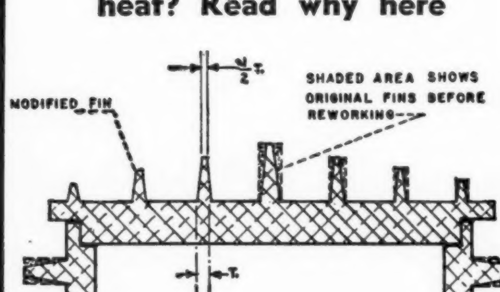
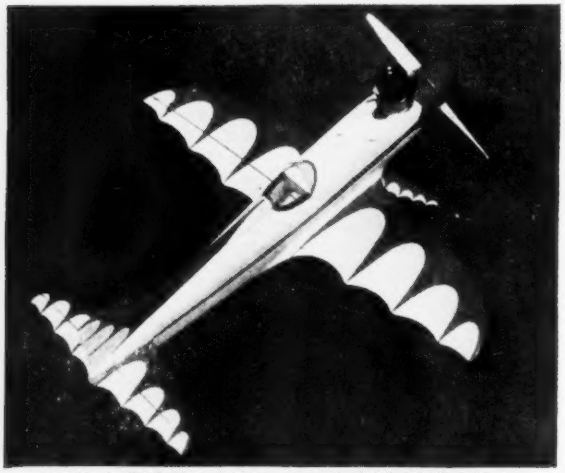


Fig. 2 How to modify cylinder fins to improve engine cooling efficiency

Another fact to consider is that engine components made of various ferrous and non-ferrous alloys and arranged in a design combination to obtain the maximum mechanical and thermal efficiency must be properly cooled. Where (*Turn to page* 59)

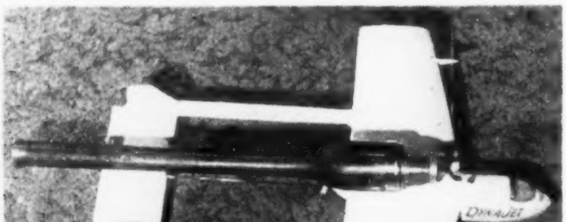


No. 1 Ed Soltis used a spray gun to finish this *Vampire*

News of Model Experimenters From All Over the World

No. 2 Sleek *Monocoupe* by Roy Long, Jr., is a *free flighter*

No. 3 E. J. Pithers flies this Percival *Prince* with two *Ohlsson 29's*



No. 4 A jet speed ship designed by Arnold J. Kelly

air ways

MOST model builders, particularly those in the Midwest, have heard the sad news of the death of June Pierce, which occurred during the 1949 Nationals, at Olathe. So many of June's modeling friends have sent notes of sympathy to his family, that they fear it will be impossible to answer them all personally as they should like to do. Mrs. Pierce has therefore sent us a note which we print herewith, and which she hopes will come to the attention of all who have written to her. She writes—

"Dear Modelers and Friends of Model Aviation:

It has been impossible for us to contact all those who expressed their sympathy to us at the time of June's passing because of lack of addresses, so we are taking this opportunity of expressing our thanks and appreciation for all the many kindnesses that were bestowed upon us at that time.

There have been so many lovely tributes made to June, and we feel that the June Pierce Trophy award to be made in his memory is the most appropriate honor possible and something that will make his name live on forever in the field of Model Aviation, which he loved so much.

So, from the bottom of our hearts, we again say thank you and may God bless you.

Sincerely,
Mrs. Pierce, Jim and Patsy."

WE HAVE received a letter from R. H. Frasher, Jr., president of the *Kanawha Valley Model Builders, Inc.*, of Elkview, W. Va. Mr. Frasher passes along a note of warning to other clubs which are operating in localities unfriendly to model aviation work. His club arranged a lease on a good flying field and spent over $300 in developing it for their use, to say nothing of the uncounted hours the members labored on the project. Following a few complaints from local citizens (doubtless "narrow-minded," as Mr. Frasher states), the city council took action resulting in the probable closing of the field for model use, and total loss to the club of all the money and time they put into it. Mr. Frasher thus says with considerable authority, "It would be our advice to any other club contemplating building a model field to build it outside the city limits by all means, because sooner or later someone will take it upon themselves to stop the flying."

The complaints in the case cited above came, as have virtually all similar complaints of which we have heard, because of NOISE made by the engines. We cannot understand why model fliers who are being forbidden to fly in built-up localities all over the country cannot realize that the roar of motor, which is sweet music to the model builder's ear, is just plain racket to those who have no interest in model flying. We have been urging model builders to use mufflers for a long time. Way back in our July, 1948, issue we gave full details on constructing several simple types of mufflers that have proven very effective.

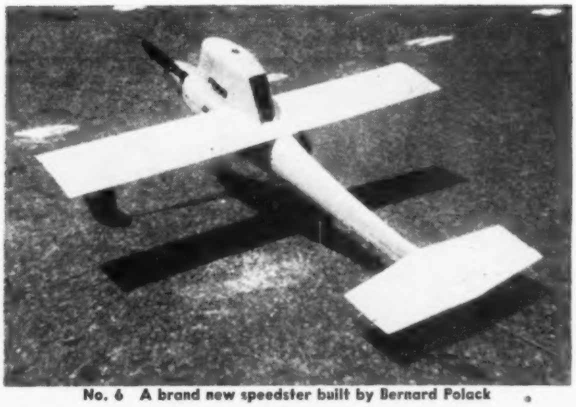
Model builders usually start raising complaints as soon as the subject of mufflers is mentioned. They say mufflers add weight and wind resistance, cost a lot of money, and worst of all—cut down the power of the motor. Aren't they willing to trade a bit of added weight and wind resistance for permission to fly their muffler-equipped ships in built-up areas? The other objections are totally invalid; the article in July, 1948, MODEL AIRPLANE NEWS, showed how mufflers can be built for a few cents. That leaves only the question of a cut in motor power. Well, you doubters, even this has been solved! A prominent motor manufacturer now offers a muffler that actually *increases* power! This muffler is designed upon a principle used to quiet the motors of full size planes. What's more it is small and light, and low-priced besides. So, whattaya say, you fellows who are losing your flying fields—give mufflers a trial and you will find it a sure way "to win friends and influence people" in favor of power modeling.

IT IS NOW no news that the Wakefield meet in England this year was won by Finland. Many Wakefield enthusiasts would doubtless be interested in a list of the placing of various countries and we print such a listing below. The U. S. Team placed as follows: 3rd, Warren Fletcher 179.8 secs. (average of 3 flights' time); 4th, Ed Naudzius 177.43; 14th, Jo Boyle 128.23; 20th, Ed Lidgard 102.77; 24th, Andy Petersen 99.47; 36th, Bob Hanford 79.23 (two flights only). The list of countries represented at the Wakefields and order of finish was:

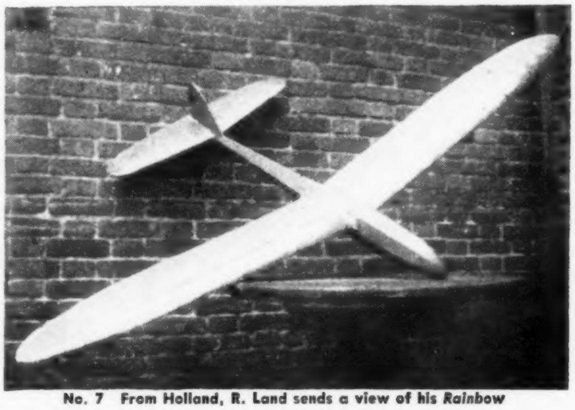
1. Finland—A. S. Ellila 183.3; *2. Italy*—E. Sadorin 179.9; *3. America*—W. Fletcher 179.8; *4. Canada*—F. Loates 157.3; *5. Sweden*—B. Borjesson 156.7; *6. New Zealand*—*B. B. March

(*Turn to page* 54)

No. 5 C. R. Wood has already retired this attractive Wakefield ship

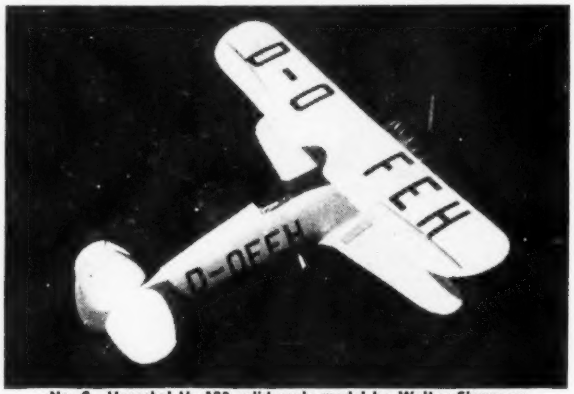


No. 6 A brand new speedster built by Bernard Polack

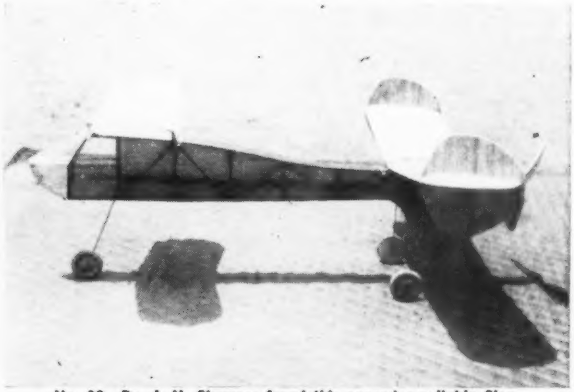


No. 7 From Holland, R. Land sends a view of his *Rainbow*

No. 8 This is *Smoky*, designed and flown by Ed Kienast

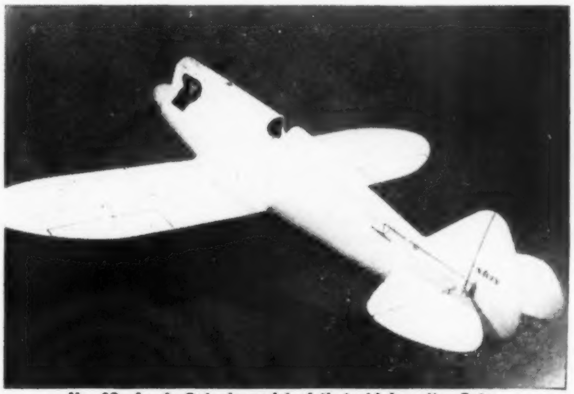


No. 8 Henschel Hs 123 solid scale model by Walter Siegmann



No. 10 Dr. J. N. Simmons found this canard a reliable flier

No. 11 Highly detailed Fokker triplane is work of Corbett K. Bates



No. 12 Lewis Caton's model of that old favorite, *Pete*

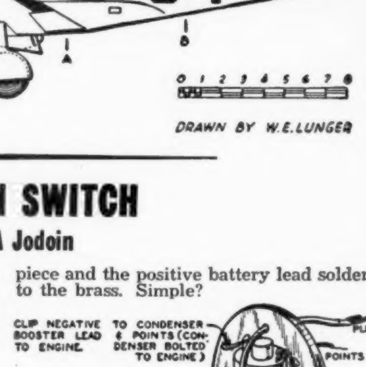
IGNITION SWITCH

by J. A Jodoin

IN wiring up one of my ships I used the hookup sketched here, with a simple, light and positive homemade switch. The hookup eliminates the "miles" of wire found in a lot of ships. The condenser was bolted on the engine, so it is not shown.

I used alligator clips on the booster leads; clipped the negative on the exhaust stack and the positive on the projecting end of the switch.

The switch is made by fastening a ¼"-wide copper strip on the motor mounts at a convenient point. Two brads are bent in a U shape after cutting off the heads, and are used to fasten down the strip, bent in the manner shown; then the coil wire is soldered on. A small strip of spring copper or brass is bent and screwed into the cross-piece and the positive battery lead soldered to the brass. Simple?



SIMPLIFIED IGNITION HOOKUP

THE WINNER! in every class
DURO-MATIC McCOY
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The IDEAL Engine for the novice to easily and quickly learn to fly U-Control and Free Flight with small planes. This little engine is a REAL McCOY, built to the same precision standard as its bigger brothers. With New DUROGLO an improvement in ignition as far advanced as the glow plug was over spark ignition.
"19"
$9.95 with HOT-POINT Glow Plug
America's most popular engine. A powerful, dependable, easy starting power plant at a popular price for the beginner.
For the fellow who likes standard ignition the McCOY "19" sells at the remarkable low price of $10.95.
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$11.95 Designed by the World's Leading Manufacturer of racing engines to meet the demand for a Class B popular price McCOY.
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$14.95 Sportsman "Jr." (36)
For fun this is the popular price engine for all sport flying with HOT-POINT Glow Plug.
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This engine delivers high rate-of-climb for free flight with plenty of controlled power for stunt and precision flying.
TESTORS Freshman Kit, Propeller and new all-purpose "39" Fuel are tailor-made for perfect flying performance with either the McCOY "9" — "19" or Sportsman "29" Engines.
THE ACCEPTED STANDARD FOR CONTEST FLYING
WORLD FAMOUS Red Head RACING ENGINES
Now Available in Glow Models
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To supply the demand of racing enthusiasts who are converting their racing engines from conventional ignition to glow models, all three of the Famous McCOY Red Heads are now available in Glow Models, embodying all the latest features of the Red Head "60" — fastest racing engine ever built.
McCOY Red Head Engines hold EVERY OFFICIAL AMA Control Line Speed Record in Class A, B, C, D in Junior, Senior and Open.
FLASH! Harold L. Springer of Indianapolis, at the Chanute Air Force Base Meet established a new World's Record for Class A with a McCOY "19."
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Holder of MORE AMA Official Records — than ALL OTHER MAKES COMBINED
FIRST IN THE AIR ON THE LAND ON THE WATER
It takes power to win — McCOY Engines supply MORE POWER than any other engine available today!

World War I

(*Continued from page* 25)

shaped to form to the curve of the fuselage. Below that, a rectangular tank of 265 litres carried the main fuel supply. This was enough to keep the 2A.2 going full throttle at sea level for 2 hrs. 45 min. This meant an air endurance of about 4 hrs. with good piloting.

The observer's cockpit behind the fuel tanks was almost a duplicate of the pilot's 'pit, including full dual controls with removable stick. In addition, the observer was equipped with radio and camera equipment for the usual army cooperation missions. The observer's armament consisted of a pair of air-cooled Lewis machine guns mounted on a Scarff brace. Some examples of the 2A.2 carried only one rear gun. The observer was equally well protected, and was provided with a retractable windshield.

Coaming around both cockpits was made of aluminum sheet. The pilot was provided with a large head rest which served the dual purpose of housing certain remotely controlled fuel valves.

The Salmson 2A.2 landing gear was an exceptionally rugged unit consisting of three right- and left-hand struts. The struts were made of streamlined steel tubing and their upper extremities were bolted to steel fittings attached to the lower longerons. The first two pairs were cross-braced with steel wire. The axle was a center-hinged split type, resting between steel tube spreader members. Rubber shock cord absorbed landing forces.

FLIGHT SURFACES. Wing arrangement of the Salmson 2A.2 was of the two-bay type. Both planes were equal in span and chord (dimensions were given in our October issue) and panels were identical except for placement of fittings. Each panel was built up of two "I"-sectioned spruce spars connected by five steel tube compression members. Steel wire cross bracings were anchored to compression tube fittings.

The thin-sectioned ribs were made of plywood with spruce capstrips. Ailerons were fitted to both wings and were hinged to the rear spar. They were connected by a single cable and were actuated by control horns and cables within the wings. Aileron framework was a combination of wood as used in the ribs, with a steel tube trailing edge.

Leading edges of both wings were spruce, with thin wood trailing edges attached to the ribs by sheet metal wrap-around fittings.

The upper wing was attached to a conventional center section following the usual construction. A few models of the 2A.2 were equipped with transparent celluloid-covered center sections.

Lower wings were attached directly to the lower longerons by means of steel fittings and shear pins. Rigging consisted of double landing and flying cables, in some cases spaced with wood strips to improve streamline, plus a pair of drift wires for each right- and left-hand panel.

Center section struts were of tapered, streamlined spruce attached directly to fittings on the third and fourth fuselage uprights. Interplane struts were unusual in that the inner and outer pairs were identical and interchangeable. They were made of streamlined spruce, wrapped with tape, and attached by means of stamped steel fittings secured with safe tied bolts. Both wings were set at 2° incidence and 2° dihedral, but were unstaggered and had no sweepback.

Tail surfaces of the Salmson 2A.2 were aerodynamically balanced but contained no fixed surfaces. The rudder was an extremely simple structure reminiscent of early Fokker, or Avro, outline. It consisted of a main spar of steel tubing which was attached to the fuselage stern post by means of steel strap hinges. The outline was of thin steel tubing, with ribs of the same type material welded in place. Rudder bracing consisted either of three or four members, all terminating at the upper end of the main spar. Early models of the 2A.2 were fitted with two streamlined steel struts in line with the upper leading edge of the rudder and attached to right- and left-upper longerons.

The elevator was made in one piece of steel tubing throughout. The tubular main spar was braced to the rudder by the aforementioned cable. Lower elevator bracing consisted of an "A"-shaped steel tubing arrangement with the apex attached to the elevator spar and the open ends fitted to the lower longerons. Both elevator and rudder were controlled by the usual stranded wire cables attached to conventional cockpit controls.

In spite of not having a fixed stabilizing surface, the elevators were "trimable" by controls rotating the main elevator spar to change its normal angle of incidence. The effect of a tail-heavy trim would result in the control stick assuming a normal angle slightly forward of center.

Among World War I Allied two-seaters, the Salmson 2A.2 was (or at least is now considered) one of the best. Fast and reliable, it was the result of good, practical thinking. Hundreds of 2A.2's in the hands of French and American pilots, proved that they could take it—and dish it out.

Cleveland Air Races

(*Continued from page* 15)

Anson Johnson, who won the Thompson Trophy last year by virtue of his ability to stay in the race when others failed, was the only one to drop out this year. Trouble with his landing gear retracting mechanism and with a shattered exhaust stack ruined his chances. However Johnny's plane should be mentioned here as one of the most cleverly altered of the racers. This F-51 had its belly radiator removed and replaced by F-39 coolers buried in the wings at the normal machine gun emplacements. It closely matched Cleland's speed for several laps in spite of the difficulties previously mentioned.

Two North American F-86 jets put on a terrific show in a resumption of the Thompson J division. Captain Bruce Cunningham, of the 334th Fighter Squadron at Andrews Air Force Base, Md., set a new record of 586.173 mph in that event. Once again, however, these Air Force boys demonstrated that pylon racing at the necessary low altitude is too severe for jet propelled aircraft. Both ships were dangerously overstrained at several points.

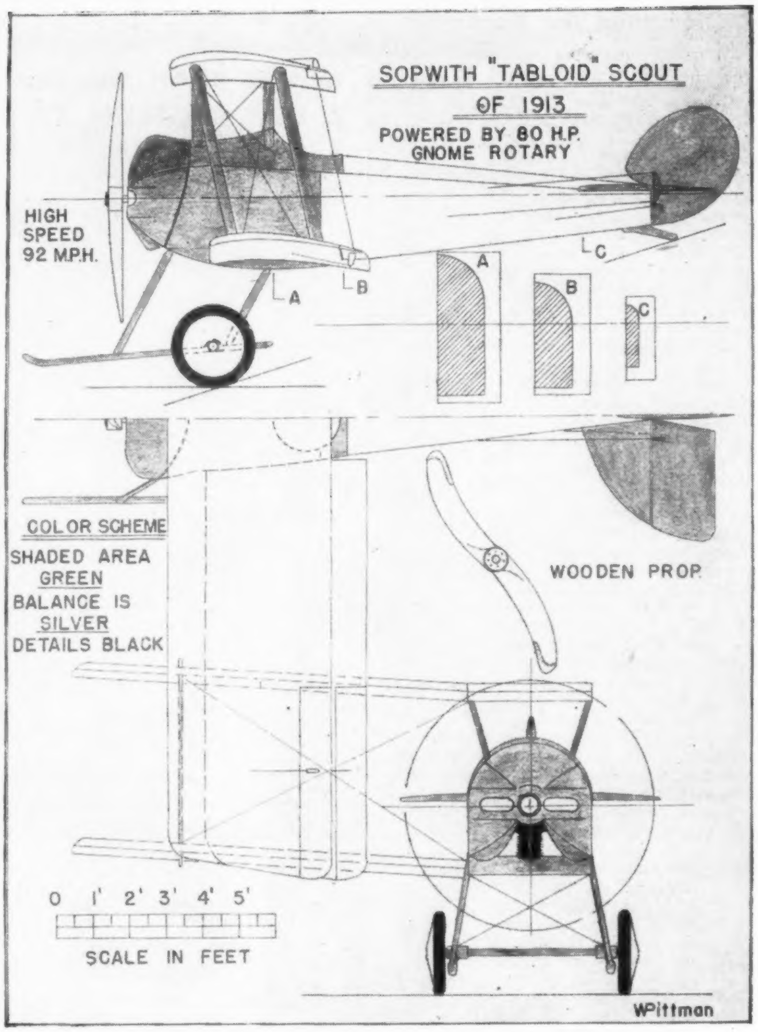
Two other big plane pylon races were flown. These were for the Sohio and the Tinnerman Trophies. The nineteen planes which attempted to qualify for the Thompson were divided into two groups, one for each race. Bill Odom took the Sohio at an average speed of 388.393 mph, while Ben McKillen won the Tinnerman at 386.069 mph. J. H. G. McArthur, of Edmonton, Canada, the only foreign entrant at the races, participated in the Tinnerman race with a *Spitfire*. He placed third, but failed to qualify for the Thompson.

Mrs. Grace Harris, of Kansas City, repeated her last year's victory in the Women's Trophy Race. Her winning time of 216.673 mph was under that of 1948 because of a change in the rules which kept out special engines and propellers on the AT-6s, to which the race is limited.

The Oshkosh team showed up in top form for the Goodyear Trophy Races. Bill Brennand, the 110-pound jockey pilot, booted home Wittman's *Buster* at 177.340 mph for another new high and his second victory in that event. Steve Wittman himself took third prize money in his *Bonzo*. Keith Sorensen, of Los Angeles, flew the beautiful Deerfly (now called *Mike Argander Special*) to second position. Fish Salmon, the 1948 victor, netted only fifth place in the completely rebuilt Minnow.

A total of twenty-five midget racing planes qualified and flew in the Goodyear heats! Many of them showed remarkable ingenuity of design and high quality of workmanship, and even the older planes sported new refinements. Both of Wittman's ships had wheel pants added since we last saw them. Salmon's plane, originally a LeVier *Cosmic Wind*, could really be called a new airplane. Only the metal covered wing remained from the original. The new fuselage was fabric covered and the wing was mounted at the thrust line. Sorensen's *Deerfly* also followed the trend toward putting the wing at the line of thrust, as did many of the newest ships. It featured a full cantilever, tapered, plywood covered wing and steel tube, fabric covered fuselage.

Construction of the Goodyear midgets seems to be following three general patterns. First, and most numerous, is the



simple Wittman design with fabric covered wings and fuselage, external wire bracing and thin airfoils. Increasing in popularity is the trend introduced by the late Art Chester, featuring cantilever wings with wood or metal covering and fabric covered fuselage. The third general type, the all-metal full cantilever ship, as exemplified by Tony LeVier and his associates, is limited to the few who have facilities for that type of construction.

Being limited to planes with 175 cu. in. engine displacement, the Goodyear is the most closely matched competition flown today. A 1-3/4 mile, six pylon oval course keeps the race within the confines of the airport and requires the utmost in piloting skill. Young Brennard, in these three years of this type racing, has become a master of the sport. Although his plane is a few miles per hour slower in the straightaway speed than several of his rivals, Bill still managed to turn the trick.

The general air show which always fills out the National Air Race program was up to its traditional caliber. Participation by the Air Force and the Naval Air Service, the R.C.A.F., and top notch civilian acts put the spectacle across in grand style.

Looking to the future we find the Thompson Trophy Race in a doubtful status. The participating pilots definitely want it continued on an unlimited basis. Its sponsor favors the same thought, while the air race management still finds the big race its greatest drawing card. However, the residential areas now gradually enveloping the great Cleveland airport may force its removal to another site.

Good news to the air race fan will be found in the Professional Racing Pilots Association's proposal for a new race in the 500 cu. in. class. Although this proposal was originally aimed at the Thompson Trophy, another sponsorship may now be sought. In any event, the thrilling game of closed course air racing is spreading out to appeal to more pilots, more designers, more backers, and more of the general public who can just sit and watch the fastest of all competitive sports.

PHOTO CREDITS

Page		
11	Top	S. H. Melman
14 - 15	All	John L. Mackenzie
21	All	Beech Aircraft
25	All	R. C. Hare

Scrap Box

(*Continued from page* 9)

entered by any Association club, north of Kern and Santa Barbara counties. Team challenges must be in an event for which association rules have been set up or recommended, such as four-man speed team, each member flying a different class, with total accumulated speed to decide; and three-man precision event with total accumulated points being the winner. The gals need not be club members, but no more than one may be on any team at one time.

Did someone say something about Juniors? Results of that same Plymouth meet tell a story. Here it is: number of entries in controline speed, Class AB combined, was 12 Open, 24 Seniors, and 7 Juniors, with 9 entries in the Novice event. In Class CD, it was 10 Open, 29 Senior, and 7 Juniors. In Novice AB only one man was able to make a run. In Junior, two entrants made runs, and the same was true in Junior CD. For that matter, neither the Seniors nor Open contestants were very much better. In jet speed, only one man in all classes and age groups was able to make a run.

Precision was somewhat better, with places from nine down being blank for Novice combined ABCD. The Juniors managed to fill in their ten places, as did the Seniors. Novices totaled 14, Juniors 19, and Seniors 29, Open but 13. As a rough approximation, outdoor rubber was comparable to precision. But free flight gas!

Take Class AB combined. Only six Novices entered, with but two showing times (the best being 2:35.2!); 13 Juniors tried with only six putting up times. Of the 26 Seniors, only eight were capable of making official flights. Those "old men," the Open Class boys totaled 31 entries. It was much the same in Class CD: 7 Juniors, with two making official flights, 16 Seniors with only 6 turning in officials, and 22 Open, with only six being able to put in flights. What significance these figures hold is left to the reader. The leaders should find plenty to chew on.

And now gentlemen, let's get away from business. What does the story bin hold? Wish you guys could see this stuff. Open the file and you have to jump back quick. Funny, but every modeler who accidentally turns loose a U-Control job thinks it a story. Hate to discourage you chaps who have had U-jobs go free flighting. Know why? This month alone, three jobs are reputed to have continued circling without lines, or with the handle dragging and the builder coming after. One landed and taxied around the circle eight times all by its lonesome. Two went cross country. One circled on up through the clouds for an out of sight. It certainly is amazing that a U-Control model can free flight but all manner of things happen when they get loose. Sometimes they loop. Mostly they go crunch! They chase the builder. They chase cows. Reminds us of Rigby—those Shredded Wheat gliders. Back in England he once entered the Wakefield. Took his job out for a last-minute check. Fog came in fast but Rigby launched the ship undaunted. Off it went, vanishing into the gray. All was still except for the click-click of something on the prop shaft. Rigby listened and listened, straining to follow its course. Then it hit him in the back of the neck. You know, there must be a moral to that one.

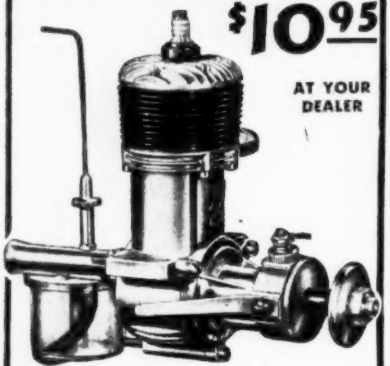
For a change of pace let's try a real tall one and forget the jokes. "After I finished my new creation," begins Bernie Lee Cawer (329 Summit Drive, South Boston, Va.), "I spent two days getting the bugs out of it. Went out to a CAA emergency field three miles away. Filled the tank and checked the ship and told a friend of mine to set the timer for 20 seconds. He set it for 45-50 seconds, but I didn't know that. With the *Forster 29* screaming wide open the ship went straight up until it was just a speck. There was wind up there and the glide was almost straight. Away it went across the river, turned over Riverdale, a mile-and-one-half from the field, then turned left over South Boston, going right over town. That was two miles from Riverdale. Then it turned again and started toward my neighborhood, coming in low and slow over the neighbor's house, just missing his kitchen chimney and landed smack in my back yard. I didn't see this happen because I was still three miles away but the neighbors, seeing it, asked my wife where I was. I figured I had lost it, recovered my tools, and cussed myself all the way home for not setting the timer myself. Imagine my surprise to find the ship sitting not three feet from the house. You could see the marks in the dirt where it touched down."

Can you fellows keep up with the chase? There's more coming. The next day, Cawer's *Wanderer* darn near repeated but fell 250' short of the house. This time it landed on a mill roof Cawer had been painting and stopped within 10' of his ladder! Don't know about you, but we're crying "Uncle" and scramming out of here. Don't grudge Cawer that free subscription for the best tall but true (some guys say we should use shaky type on *true*) of the month. When you get a slight indecisive wind, free flights will tour the country often coming back to the starting point after two or three jaunts to various points of the compass. Only the other night our *Cub*-powered job came down in a big tree. When we got there, a tall ladder was propped against the branchless trunk. If it had said 'courtesy of Herkimer, we'd stake a claim on that subscription—but it's yours Bernie Lee Cawer.

Arrow-Nut

(*Continued from page* 17)

in the tail. A trip wire is run forward to a timer in a forward section. The *Elmic* timer from England has been found to be an excellent dethermalizer timer. If you are using an ignition engine, put in the wiring system and electrical timer



now also. For a glow or diesel engine, install a timer to work the fuel valve on the engine.

With all the interior details installed, the 1/8" sq. torque bracing can be glued in. Then glue the stringers of 1/8" x 1/4" in place. One goes over each keel edge, capstrip-style, and one down the middle of each fuselage quadrant. Add the 1/8" nose planking, and the fuselage is ready for sandpapering. The tail pivot-hook and cross bar go on after covering. These details are also shown in isometric along with the exploded view of the fuselage. The cowl for the *Supertigre* is made of sheet aluminum. The *Supertigre* overheats in a full cowl, but for most engines I strongly recommend a U-control type of cowling.

The best covering material is nylon which should be applied wet. Silk is also good but not quite as strong or flexible. The covering can be dyed before using or it can be color doped later. To get a terrific gloss spray a coat or two of clear dope over the color. For a diesel ordinary dope is good enough, but for glow engines use fuel-proof dope and cement throughout.

The model is assembled in the usual way. The tail is held with rubber as if no dethermalizer were used except that the ends of the rubber must be at the peg in the boom, not at the pivoting hook.

When the trigger valve is tripped, the plunger jumps in clearing the pivot-hook. This allows it to pivot so that the rubber slips up off catching the peg in the trailing edge of the rudder. The tension of the rubber lifts the tail. A string is used to limit upward travel. This release is virtually foolproof.

The method of adjusting was developed around racing and diesel engines, but applies to any type of powered model. It is very safe, unless a model is downright unstable, and it's a remarkable timer-saver.

Start by hand-gliding until a *straight* flat glide is obtained. Then make the glide a trifle nose heavy. This prevents any tendency to loop at high power. Set the timer for a short engine run of 3 to 6 seconds, depending on the size of the model—big ones react slower. With the average bore small C engine, the timer should be set for 4 seconds. This run will allow time to see what the model wants to do under power without letting it wrap up.

Turn the model loose now with a short run and nose-heavy glide at *full power.* Be sure to notice which way it turns under power; set the rudder to glide in the *opposite* direction. Then any spinning tendency under power will be offset. Continue to fly on short runs until the model circles tightly in the glide with a wide or opposite turn under power. Then flatten the glide back to normal and gradually increase the engine's run to 20 seconds, about 10 flights should be sufficient for the complete test, and your model will be using all the power its engine can grind out. No time is wasted flying at low power. A word of caution: if you change to a new type of prop, go back to a short run. Any big difference in engine speed can have marked effects on a model's turning tendencies.

The vital statistics on the *Arrow-Nut* are as follows: span 66"; length 50" (less spinner); area 600 sq. in.; and weight 40 oz. I used an Italian *Supertigre* diesel of .36 cu. in. displacement turning an 11 x 6 testor prop.

Good performance should also be obtainable from any engine of .29 to .45 cu. in. displacement. For the smaller engines, try to keep the weight down. For a *McCoy 29*, use a 9 x 3-1/2, 9 x 6, or 10 x 3-1/2 prop.

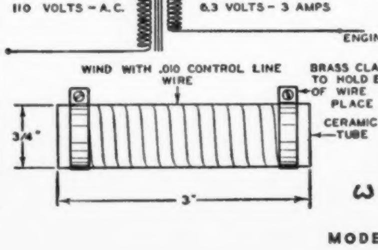
A *Forster, Ohlsson,* or *Torpedo* will probably work best with a 10 x 6. The exact prop depends on the best rpm of the engine, but the above should be pretty close approximations. Incidentally, my *Arrow-Nut* glides left and climbs wide left.

GLOW PLUG HINT

by Clifford Stebbins

THIS unit was designed for use on the Glow Plug or Hot Point plug. The transformer is of the type used in radio building and can be found in any radio wholesale house for about $2. The resistor is of a value that would be difficult to obtain, and so one was made using .010" steel controline wire. About three feet should be more than sufficient, the final length being determined by cut-and-try. The wire is wound around a 3/4" ceramic tube that can be bought at a radio store for a few cents. The wire should be spaced evenly on the tube and securely fastened at each end by a band of brass or copper.

When the unit is assembled, the plug should be removed from the engine in order to note the amount of glow. The glow should be comparable to that obtained when using a large dry cell. If it is not, move the wire from one end of the resistor and move it up one turn at a time until the glow is normal. Cut the wire here and fasten it under the clamp again. Do not make the glow too bright as it will burn out the plug. Also, never leave the wire connected to the plug after the engine has started to run, as this will also burn out the plug.



Old Dependable

(Continued from page 27)

strips, glue in all uprights. The brace where the dowel will be inserted is cut from a piece measuring 3/32" x 1/4" and a generous amount of glue should be applied here. Add gussets cut from 1/16" sheet at this point, and allow the frames to dry thoroughly before taking them up. Make two identical side frames. Formers from 1/16" thickness sheet are cut out next. Those running along the top should be notched for the longerons prior to assembling the fuselage. The bottom formers are glued directly to the 3/32" square crossbraces after assembly of the fuselage is complete. Sand all formers smooth with fine sandpaper. Assembling the fuselage is best done by inserting the middle formers and bottom braces first, then drawing both the front and rear together. This will result in a fuselage free from distortion. When the glue has dried enough so the frame can be handled, add the bottom formers and allow ample time to dry. Square stringers of 1/16" are now glued in their places to complete the structure. Just make certain that the notches are cut out as you proceed with your work. This will make for a uniform looking fuselage. Remember that the center stringer on the bottom begins at former 2-B. This, of course, is necessary to allow enough space for later attachment of the landing gear. Fill in between formers 3-T and 4-T with 1/32" soft sheet, and after this has dried, cut the slot for the wing to slide through.

The nose block is shown clearly on the drawings. It should measure 1-5/16" x 1" x 3/4". When you have cut it out roughly, use heavy and then fine sandpaper to finish it off. With a pair of metal-cutting shears, snip out two fittings from a tin can Drill tiny holes for the prop shaft and bend on the broken lines as shown. Sink these fittings into the front and back face of the nose block. Apply a liberal amount of glue at these points to make for permanence. Dope the block several times before setting it aside.

Obtain a small block of soft balsa measuring 5/8" x 3/8" x 3/4" for the tail plug. The side and top views plus the isometric drawing should be self-explanatory. Make it slightly oversize so that it can be blended in with the fuselage outline after being glued in place at the extreme rear. Dope as was done with the nose block.

The method of landing gear attachment has been made both simple and sturdy. No dimensions for the wire are shown on the drawings. However, it is only necessary to make the wire long enough so that a prop clearance of 3/4" is realized. Note on the drawings how the .034 wire is bent to shape. Cement securely to former 1-B. Glue in the two 1/16" x 3/16" pieces between formers 1-B and 2-B. Leave a space of 1/8" between these pieces for the fairing. Use pins to keep everything in place, if necessary. Now make up the fairing of 1/16" and 1/32" sheets. Glue together and let dry thoroughly. In the interim you may start on the nose wheel. This is made of 1/4" hard sheet. Describe two 1" circles and cut them out. Cross grain these discs and apply cement generously. If possible, clamp together so that the pieces will dry under pressure. By this time the landing gear fairing should be dry so streamline with fine sandpaper prior to gluing it in place. Slip it into the slot and apply cement. Bind to the wire with thread and allow plenty of time to dry. Remove the clamp on the wheel and then cut and sand to shape as depicted. Drill a hole through the center, then cement brass washers on both sides to serve as a bearing.

The stabilizer can best be started by laying down the spar, cut from 1/16" stock. Taper the piece from 1/8" at the center to 1/16" at the tip. The airfoil for the stabilizer ribs can be found in broken lines on the plans. All ribs are cut from 1/32" stock with the exception of the center and end ribs; these are 1/16" thickness. After notching them to the desired depth, cement in place on the spar. Tilt the center rib to allow for dihedral. Add the leading edge of 1/8" square which, of course, is also tapered to conform with the spar. Finish by cementing the trailing edge of 1/16" x 3/16" in place. While this component is drying, cut out the triple rudder combination from 1/16" medium hard balsa sheet. Streamline with sandpaper and apply a coat of dope. When dry, sand smooth. It would be well to draw a light line horizontally across the twin rudders to prepare them for immediate assembly when that stage in construction is reached. Lay these parts aside and make ready for wing construction.

The wing structure adheres strictly to conventional methods; therefore, no trouble should be encountered here. A template for the rib section should first be cut out. Every rib is of 1/32" thickness aside from the two ribs located where the wing is cracked for its dihedral. These should be made from 1/20" sheet. Pin all ribs together and sand down irregularities. Before cutting the notches for the spars, make certain all ribs are of the same length. Now notch them for the spars. Pin the bottom spar in place directly over the plans. Cement the ribs in their proper positions. A sturdy length of 1/8" square for the leading edge should be chosen. Round this off to conform with the wing sections, then glue in place flush with the ribs, holding it in place with pins. Add the trailing edge in a similar manner, then the tips of 1/16" sheet, and allow ample time to set. Finish off by cementing the top 1/16" sq. spar in place.

When thoroughly dry, sand lightly before cracking the wing for dihedral. Crack the wing at the indicated points, and cover with glue. This is one place not to use cement sparingly. Add reinforcement gussets of 1/16" sheet. Use blocks and pins to hold the wing while drying. The blocks sometimes have a nasty habit of shifting, thus raising or lowering the dihedral; therefore, it would be well for you to check this from time to time to make certain that the tip has 1-3/4" and the inner portion 1-1/4".

The propeller is drawn 1/2 scale on page 26. Select a hard block measuring 8" x 1-1/4" x 7/8", and blank it out accurately as shown on the plans. Cut away the shaded portions carefully by using shallow strokes of the knife. In this way you will not make the mistake of cutting too deeply thus going beyond the lines. Cut away both sides of the blade until you are down to approximately 1/8". The best way to shape the concave or back face of the blade, is to use rough sandpaper and the point of a sharp pen knife. This is a tedious job but a necessary one. Round off the blades gracefully and balance perfectly. Apply at least three coats of dope, sanding lightly after each coat. Attach any free-wheeling device that works well, then insert the prop shaft. This is also bent from .034 wire. Slip a few washers on the shaft and as-

(Turn to page 44)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semble to the nose block. When the hook has been formed, it would be a good idea to slip a small piece of rubber tubing over this to prevent the rubber motor from cutting through.

Since the fuselage has many rounded parts, it will be found most convenient to cover the top and bottom with small pieces of tissue. Use fairly thick dope as the adhesive. As the sides are flat, they require only one piece of tissue each. The wing is covered in the familiar style, the tips on the top side each require a separate piece. Complete the covering by working on the stabilizer. Spray all parts with water. Keep a constant lookout for warps which may crop up if you are not careful. One application of dope is given all parts. Again, watch for any tendency to warp out of line. Trim the rudders in your favorite manner and make ready to assemble the parts. Cement the twin rudders to the stabilizer and the remaining one in its place atop the fuselage. The twin rudders are toed in 1/8" as indicated on the plans. Cut two holes in the sheet balsa fill-in at the rear of the fuselage for the elongated stabilizer leading edge and spar. These holes must be cut just right so the stabilizer will have the required degree of positive incidence. When you are satisfied with your work, cement the stabilizer in place with the right amount of dihedral. Before leaving the ship to dry, be certain all components are aligned properly. Shape the dowel from either very hard balsa or white pine.

Make up a ten strand motor of 1/8" flat brown rubber. Leave a little slack to provide for those ever important additional turns. Lubricate the rubber, then wipe off the excess to prevent splattering of the fuselage. Attach to the rear dowel and to the prop shaft. The wing is held on with a strong rubber band. Slip a 1/8" square piece of balsa underneath the wing leading edge and make sure the wing is fastened on securely enough to hold this in place. Now take *Old Dependable* to your favorite flying field for testing.

You will soon find that the ship is exceedingly easy to fly; nevertheless, take caution not to become over eager to fly it. Make every effort to test fly it sensibly and carefully by using the following procedure: glide it from shoulder height and note the descend. It should be fairly long and floating. Put about 60 hand winds in the motor and hand-launch it. Never throw the ship when launching, for this will create excessive forward speed which might well end in an artificial stall. Correct any tendency to stall under power by inserting 1/32" slivers of wood between the top of the nose block and fuselage. Likewise, a right circle can be made by repeating this operation, but inserting the slivers on the left side of the model to offset the thrust line to the right. When properly adjusted the ship circles to the right in about 30' circles, climbing steeply. Fully wound and hand launched, the first burst of power carries it up in a steep climb gradually circling to the right. Each successive circle becomes smaller until power is exhausted. Because the ship flies in this manner, it covers a great deal of ground in a short time. Its glide is also to the right and is guaranteed to open the beginner's eyes to saucer size.

Model Portraiture

(*Continued from page* 13)

desk or floor lights used as the light source. The focusing card should be about 6" or 8" square and have black lettering ranging from 1/32" to 1" high located about lens high. Either printing cut from magazines, etc., or hand lettering is suitable. Don't use colored letters on the focusing card unless you have an achromat, rapid rectilinear or anastimat lens as different colors focus at slightly different distances than black through lenses not corrected for color. If it is corrected, than the use of color on the focusing card is desirable as maximum brightness of the color helps indicate sharpest focus. Part One of this series (see November, 1949, issue) shows a picture of lettering on tracing cloth in front of a desk light, which provides an excellent focusing card.

Now with the shutter set at T, open it and set the diaphragm at the *largest* stop opening (smallest f/ or U. S. No.). Have the focusing scale set at the shortest distance and have the camera positioned silghtly less than this distance from the focusing card. Observing the image formed on the ground glass, move the camera back until image is clear, then back and forth until it is in *sharpest* focus.

The image can be seen much better if the room is dark except for the light on the focusing card. A black cloth over the head can be used but will be found unnecessary if the room is dark. A magnifying glass of about 2" to 5" focal length can be used to enable you to see the image more clearly to determine sharpest focus and it is then that colored letters will show up brightest through a color-corrected lens.

An additional help is to treat the ground surface of the glass (rough side) with vaseline, rubbing it in well and then wiping it off thoroughly with a lintless cloth. Be sure the ground surface is next to the film exposure opening of the camera (smooth side to the back) since the image is formed on the ground surface and likewise on the front side of the film when subsequently taking pictures. Measure the distance from the lens to the focusing card and make a note of it. For this purpose a chart such as the following is advisable:

Scale Notch......	3	3^3	3^6	4	5
Actual Measure..	35"	38"	42"	47"	58"
Scale Notch......	6	8	10	15	
Actual Measure..	5' 9"	7' 8"	9' 6"	14' 4"	

This particular chart takes in five notches in an extension scale, the positions for which were initially determined roughly by ground glass focusing. Upon careful rechecking these notches were found slightly in error as shown in the lower row of figures and the 6 to 15 foot notches of the original scale were also found somewhat off as indicated. The suggested chart serves for future reference as a guide for accurate focusing rather than using the scale notch markings which are not altogether accurate on many of the older types of cameras produced before the present day precision cameras.

MEASURING TAPE—A convenient accessory for measuring focusing distances consists of a dressmaker's tape-measure of the spring rewound type also pictured in Part One. These can be secured in the four-foot length at most dime stores for a quarter. The tape housing is soldered to a bail that is detachably pivoted to the lens board of the camera and the push button of the tape-measure that has to be depressed to return the tape to its housing is permanently held in the depressed position by a strip of tin.

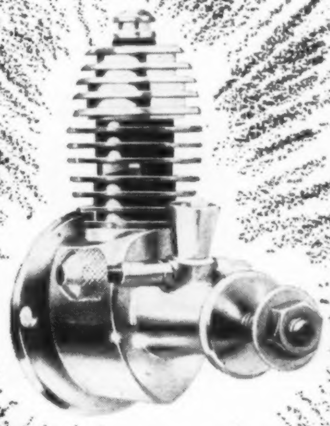
The bail should be about 2¼" wide and 2¼" long to clear a supporting cone for supplemental lenses to take pictures closer than 3' which will be described in the next article of this series. The outer end of the tape is cut off so that readings are in actual inches from the lens of the camera to the focusing card when checking focus on the ground glass.

The tape, of course, should be extended along the lens axis for accuracy. The tape housing should therefore be supported as by a wire hook up to the top of the lens board. When focusing on the ground glass and when photographing subjects, the tape housing would be in the way, so can be swung back to rest on top of the bellows or dropped down against the camera bed.

(To be continued)

Here it is — Torp Jr.!

THE ENGINE THAT'S LOADED WITH DYNAMITE



.035 PROVES STANDOUT IN CLASS AA

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And look at this price complete with fuel tank and K & B Glo-plug

$5.50

K&B

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Power Control

(*Continued from page 23*)

When a system inherently solves so many of our problems at once, we feel that it is worth working with.

In order to review the story of power control for the record, we should go back to the days of simple two-speed control when the possibility of multi-speed operation was only a dream. This was not very long ago. Many hours were spent on the problem in connection with the spark ignition engine. Suffice it to say that the most common method of two-speed control on spark ignition is the double-breaker point method. Cut-off was handled by means of a thermal delay switch in the battery lead to the spark coil. This is all obsolete now and good riddance—glow plug has the advantage. The effect of glow plug fuels on airplane finish is mild and not considered as serious a problem as it was rumored. The price of glow plug fuels is a little high considering the quantities that must be consumed, but these disadvantages are outweighed by the fact that glow plug fuels will run on a wider range of fuel/air ratio than the old white gasoline. Besides the more trouble-free operation, the weight saved (spark coil, ignition batteries, condensers and timer points) cannot be ignored.

The problem of two-speed control on glow plug is quite different from spark ignition. There are no timer points to switch or electric circuits to open. Instead, we must work with the fuel and air alone. At first a simple choke was tried. This works in a sense but it is not very satisfactory. Although the choke reduces the amount of air that enters the engine, it also increases the rate of fuel flow drastically. You get reduced speed all right, but the engine consumes buckets of fuel and the exhaust products shower the ship with castor oil. It is necessary to maintain the fuel/air ratio within a reasonable range in order to operate with fuel economy and also to keep the exhaust reasonably dry. Next we tried a simple butterfly throttle even though it meant drilling holes in the engine. This might work if the air inlet to these miniature engines were high-class venturis, but this is not the case. All engines that we are interested in have more or less simple tubes for air inlets and rely on air velocity past the needle valve body to induce fuel flow; a throttle valve stops this air flow, so as a result, fuel flow stops. Hence the engine will not run because of too lean a mixture. Next, a double valve was tried as sketched in Fig. 1. The needle valve of our *Ohlsson 23* was straddled by two butterfly air valves linked together. The valve above the needle acted as a choke and the valve below acted as a throttle. For simplicity, it can be considered that the throttle reduces the air entering the engine, while the choke creates the necessary suction to maintain fuel flow. We still have one ship equipped with this method as shown in Fig. 2. A simple electro magnet (in the rear right corner of the engine compartment) operates the linked valves from wide open for full power to almost closed for low power. Since we use a Rudevator for control, the electromagnet is energized through a wiper contact on the Rudevator escapement wheel on the UP and neutral after UP control positions. This gives full power. All other control positions give low power since it is low power that is used the most in flight. The same idea could be worked on a simple rudder escapement in which, say, neutral after right would be high power and all other controls low power. Or, since this would make it necessary to skip neutral after right and dwell on neutral after left to avoid high power, perhaps it would be better to put high power on some half rudder control position even though more servo batteries may have to be installed in order to supply the escapement magnet for the time that the transmitter signal was held on to get full power.

When it comes to experimenting with these extra controls, Rudevator has the advantage because it has four neutrals to play with instead of just two. Another way of saying it is that for a given four-point escapement wheel, Rudevator gives four controls (right, down, left, and up) and four neutrals (one between each control) whereas the rudder escapement gives only right and left rudder and only two neutrals. The half rudder positions in between are (in actual practice) wasted. However, the double valve power control will operate with any escapement control. The reasons why we consider it obsolete are as follows: it is intricate and requires drilling holes in the engine to install. Also it does not include cut-off. For cut-off we tried a thermal delay operated fuel cut-off. This worked but again it was not satisfactory. Unless bimetal thermal delays are compensated both for air temperature and battery voltage they are guess work at best. Next, we developed a fully enclosed magnetic check valve. This valve in its experimental form is shown hanging outside the engine compartment in Fig. 2 and Fig. 3 is a sketch of it.

The valve is operated by an electromagnet and it turned out to be easier to build than expected. In fact, Dick Schumacher built it, and he has never been known to wind a coil in his life. Since the valve is enclosed in what is the equivalent of a very small fuel tank, about a three-second time delay occurs before cut-off which is just what is needed. The contact for this electromagnet cut-off was obtained from another wiper on the Rudevator escapement wheel and the neutral after down was chosen for the cut-off control position.

Much flying was done with this double magnet, double valve two speed and cut-off combination. Gradually the disadvantages became apparent. Two magnet coils for power control was not exactly intolerable but it was certainly a high enough price to pay. More important were the facts that batteries were being used too much of the time and two more pen cells had to be added to get a reasonable battery life. Then too, when we wanted full power, the sudden surge would nose the ship up and make smooth flying difficult.

We feel that two engine speeds are just not enough. If we set the low speed low enough for touch-and-go landings, then we had to be very careful on that first turn after take-off because rudder would give us the low speed and the ship would threaten to sag in the turn and hit the ground. On the other hand, if we set low speed high enough to take care of this, we could never get the ship down with the motor running for a touch-and-go landing. There was an optimum power setting for low power that would work but it was always too hard to find and maintain.

It was obvious that we needed at least three engine speeds to meet all requirements. This could be done with a lot of machinery but how could it be done *simply?* Admittedly it took a lot of time, (but then there wasn't much in the way of brain power to work with!) and Mother Nature was waiting at every turn to see that we didn't get something for nothing.

Our present method of power control may well come as somewhat of a shock to those who are used to using a simple tank and a piece of rubber hose for a fuel system, but that is a typical reaction to something new. Furthermore our new fuel system is pressure-operated. That alone will probably raise the eyebrows of many modelers until they realize how low the pressure really is and how simple a pressure fuel system is to handle.

Credit must go to Jim Walker for revealing the possibilities of a pressure fuel system to the author. Jim has been working with pressure for some time in order to lick some problems of his own. Jim also gave us the idea of the balloon fuel tank which appears in Fig. 2 and which served pretty well as an interim fix for the fuel feed problem in the violent maneuvers mentioned earlier. However, the balloon tank was messy and is now also a part of past history.

In order to have a name, we call the latest arrangement a "control tank" fuel system, because the whole idea revolves about a control tank which serves several func-

(*Turn to page 48*)

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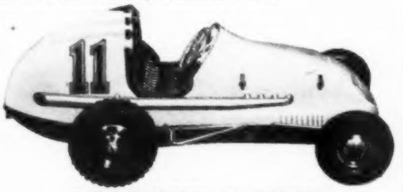

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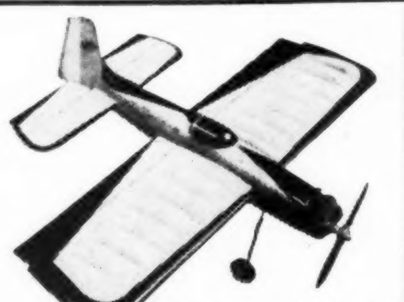

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tions. Once the control tank idea was latched onto, many different configurations were tried starting, of course, with the most complicated and ending with what we think is the most simple. However, the system has many possibilities and users may choose to juggle the details a little. In time we probably will ourselves.

A complete discussion of the pros and cons of the system and plans for building its component parts will appear in a succeeding issue but with the space remaining we can at least get started on an introduction. Much of the development work consisted of simplifying the parts so that commercially available parts could be utilized. This is especially true of the engine. Some time was required to find a type of air valve that was simple and universal enough to be installed in any engine without too much exacting workmanship and without requiring that holes be drilled in the engine. The whole project came to a grand climax when a real universal valve was found.

Fig. 4 will help to convey the theory. The main tank is a large size *Austin* flight timer. With a little rework, this item is very satisfactory for the purpose and affords a fuel supply under slight pressure. Fuel is held in the main tank by the electromagnetic check valve, but flows through the latter when the valve is energized by a couple of pen cells. The construction of the electric check valve is similar to that shown in Fig. 3. (Full plans for it will appear in the next article.) From the check valve the fuel goes to the all important control tank. This is another *Austin* flight timer, but this time we use either the *Austin Timerette* or the still smaller *Baby Timer*. The spring in this timer is replaced with a much lighter one. From the control tank, the fuel line goes on to the engine needle valve.

All of the main tank volume is used but we need only a part of the control tank volume. When the electromagnetic check valve is opened (either by radio or by controline switch), fuel flows from the main tank into the control tank and forces the control tank piston out under very light spring pressure. This motion is the heart of the fuel system. The motion is linked to a plug type of throttle valve in the engine air inlet. We said before that a throttle valve would not work, with these small engines and their simple tube air inlets, but we were talking then about suction fuel systems; now we are talking about a *pressure* fuel system. The light spring in the control tank forces fuel into the engine and at a rate that is reasonably correct for the amount of air that the throttle valve is letting into the engine. Because of this very useful pressure, the control tank doesn't need to be near the engine. The piston rod motion can be extended from almost any convenient distance to the throttle valve.

With fuel under slight pressure at the needle valve, the fuel feed problem in violent maneuvers is taken care of. Fuel flows from the needle valve under the combined action of both pressure and engine suction. Therefore, when the engine stops, the suction stops and the fuel flow all but stops so the problem of flooding the engine is not near as great as one might expect. However, there is an ideal way of doing everything so we choose to mount the engine on its side with the intake tube horizontal. A detail in the rework of the control tank also has a solution for this problem.

It is the details that determine whether any theory will work or not. For instance in this fuel system, when the control tank fills, the piston rod moves the engine throttle open toward full power. Nevertheless, we don't want this to happen too fast or it will be tricky to control, so an adjustable clamp is added to the hose that leads from the check valve to the control tank. This is used to adjust the rate at which the control tank fills when the check valve is opened. Another detail is a very simple hose clamp between the control tank and the engine needle valve. This is used in ground handling to shut off this line so that the needle valve setting need never be disturbed from its adjusted position. When the check valve opens, our present setup is adjusted so that full power is attained in about 2 secs. from idle. The control tank stroke is adjusted to give about 50 to 60 secs. of engine run before low power idle is reached.

In practice, very little attention is needed to control power. Remember, we use Rudevator which is a cyclic control. This means that we go through the check valve operating position once in every revolution of the escapement wheel. Therefore, the control tank gets a pip of fuel every now and then whether we remember it or not. This power control position is the neutral after down. If the ship is obviously sagging for want of power (whether we can hear the engine or not), then a short dwell on neutral after down will pour the coal to it. On the other hand, if the ship is obviously climbing away because of too much power, then we have been going through neutral after down too slowly and must remember to get through quicker the next few times. How do we get cut-off. That's simple. Just stay off of neutral after down and in less than a minute the control tank will run out of fuel because it can't get any more from the main tank. Runaway cut-off is very similar. If we can't get a signal through to the ship, then we can't get fuel through to the control tank.

How do we get low enough power to do touch-and-go landings? How do we keep the control tank from running out of fuel when it is near empty? How do we cut the engine if the ship runs away while in neutral after down? Don't worry, it's all figured out for you. Come to the next meeting in Part Two which you'll find in the January issue.

Design Forum

(*Continued from page 24*)

such an airflow may occur at 5 mph. The chord or lineal dimension L is, we will say, 3". Now we increase the speed of this wing, to 10 mph. The flow then will appear as in Fig. 2. Instead of hugging the trailing edge of the wing section, the flow pulls away from the upper surface slightly more than in Fig. 1. If the speed is increased still further, the flow will separate entirely from the trailing edge and cause considerable drag and low efficiency. Consequently, in order to prevent separation and to retain efficiency at higher speeds, the wing section must be changed to a section similar to Fig. 3 where the high point of the curve or camber is nearer the leading edge than the trailing edge. This conforms to the accepted idea of a wing section.

However, the Reynolds Number effect indicates that at slow speeds (speeds at which many outdoor models fly) a wing section with the high point at the center

of the wing will be just as efficient as one with the high point further forward; in fact more so in some cases.

If we have two wing sections both flying at the same speed, but the second has greater chord than the first, the air flow around the first will be similar to Fig. 1, the air flow around the second will tend to be like Fig. 2. We see that increases in velocity or lineal dimension of the airplane wing tends to straighten out the air flow rearward of the high point of the camber instead of letting the air flow curve down and seek the downwardly curving surface. Some merely say that the Reynolds Number is *greater* in the second case.

An increase in the density of the air also has the effect of increasing the Reynolds Number; that is, if Fig. 1 represents a wing passing through the air at density 1, then at increased density 2, the air flow will tend to be more like Fig. 2. From a mechanical sense this action may be explained by the fact that with greater density the molecules of air are closer together and tend to follow a straight line when in motion more so than they do with lesser density.

Viscosity has the reverse effect. This may be defined as a tendency of the molecules of any fluid to be held together. We might call this the attraction between the molecules, or their capacity to resist separation. We can see that this resistance to separation tends to keep the molecules flowing smoothly. At low viscosities, where there is little attraction, the molecules of air separate easily from one another and tumble without any particular flow pattern; they become turbulent in flow. Consequently, at high viscosities, the air flow will not separate from a surface passing through it as easily as at low viscosities.

Knowing the characteristics of these mathematical factors, we can write a simple formula as follows: R.N. = $\frac{pVL}{\mu}$.

p represents the air density which, under standard conditions of 15° centigrade and 760 millimeters pressure is 0.002378. V represents the velocity of the surface passing through the air. L represents the lineal dimension which usually is taken as the chord of the wing. μ represents the viscosity which is 0.000000373 slug per foot per second.

For simple calculations, standard conditions may be taken. However, for the precise work required in full scale aircraft, corrections can be made in density and viscosity for different temperatures and pressure. For simple calculations which can be applied to models, the formula will read: R.N. = (6,380) VL. Suppose we calculate the Reynolds Number for an average gas model under standard conditions as follows: Chord, L = 1 foot; Velocity V = 30 feet per second (approximately 21 mph). Now, inserting this into the simple formula we have: R.N. = 6,380 x 30 x 1 = 191,400. So, for the average gas model we have a Reynolds Number of approximately 200,000. Now you can calculate the actual value for any particular model by applying this formula.

When applied to the average rubber-powered model, we have: L = 0.4 foot; V = 15 feet per second, so R.N. = 6,380 x 15 x .4 = 38,280. Rubber models, therefore, have a Reynolds Number of approximately 40,000. Now look at indoor models. In this case R.N. = 6,380 x 1.5 x 0.4 = 3,828, approximately 4,000, 1/10 of that of outdoor rubber powered models and 1/50th of gas models.

Results of thousands of flying hours by hundreds of model builders give credit to the fact that with Reynolds Numbers below 40,000 as in outdoor rubber models, the precise form of the wing is very much less important than with higher Reynolds Numbers. These tests also indicate that greatest efficiency at low Reynolds Numbers is obtained by placing the high point of the curve or camber further to the rear or nearer the trailing edge than is customary in full-scale airfoils. It may be said that below a Reynolds Number of 10,000 the camber may be two-thirds of the chord back of the leading edge and still have excellent if not superior efficiency. Apparently as the Reynolds Number becomes lower, the high point of the camber moves rearward for maximum efficiency until at infinitely small numbers it reaches the trailing edge and the wing surface then is flat like a butterfly's wing.

Some students of aerodynamics may remark that this reasoning does not conform to or justify the results attained with the laminar flow wing. However, if you study the air flow conditions of such a wing you will see that the airfoil shape itself is merely the leading edge of a wing, with a short stubby tail at the rear. Actually this does uphold the reasoning above because you will note that the air flow streaming from the laminar flow wing, Fig. 4, as indicated passes back nearly on a straight line from the high points of the wing. If a trailing edge is drawn in at the rear of this wing to follow these air flow lines as indicated by the broken lines, Fig. 4, we would have a wing with the maximum camber very close to the leading edge. However, in actual practice we must measure aerodynamic efficiency against weight and frictional drag. Although the air flow would be perfectly smooth around the elongated wing in Fig. 4, the chord is so long compared to its thickness that such a wing will have much more surface causing much greater frictional drag. It also will be heavier due to the greater amount of material required in the structure. It has been found that the added drag of the laminar flow wing in Fig. 4, due to the abrupt change in camber near the trailing edge, is very much less than the frictional drag of the larger wing and that its weight is also very much less, which adds to its effective flight efficiency.

Conclusions which may be derived therefore are as follows: for indoor airplanes, slightly curved surfaces of a circular arc section may be used efficiently. In rubber powered outdoor models, the high point of the camber may be 40 or even 50% of the wing chord rearward of the leading edge for maximum efficiency. High speed gas models should have wings with sections similar to full scale aircraft. The high

camber point, however, may be further back than on full scale wings if desired, without loss of efficiency. In the average gas model, it is well to use a wing section with the trailing edge curved well downward because such models glide at speeds at which the Reynolds Number is quite low, from 170,000 to 200,000. This accounts for the excellent performance of the Grant C-8 wing section shown in Fig. 1 of the September '49, *"Design Forum"* article. In fact, the high point of the camber may be moved back from the one-third point to the 45% point with excellent results. You may have noted that many gliders which fly at comparatively slow speed have trailing edges which are curved well downward. These sections are particularly adapted to the slower speeds of gliding flight compared to the higher speed of powered aircraft.

Much more can be said about the effect of the Reynolds Number but these few facts may serve as a basis for future experiments which you may make with models. There is still much to be learned, and it is this that makes experiments with model wing sections extremely intriguing. This discussion was inspired by a letter from Mr. P. E. Markle, of Fairland Street, Pittsburgh 10, Pa., and we hope that it answers his questions and those of friends who are interested in this phase of aeronautics.

Mr. Max Pugh, of North Main Street, Frankfort, Ind., would like to have the ordinants of the Grant C-8 wing section. These will be published in a future issue together with one or more other interesting sections.

Fig. 5 shows a slow speed section which may prove interesting to test on some of your future models if for no other reason than to prove the efficiency of a section with the high camber point well rearward.

Harry F. Hilman, of Pentwater, Mich., has become interested in flaps as a means of dethermalizing his models. He is particularly interested in a suitable airfoil with which his flap may be used. This brings up another interesting point in model wing section design, one which is very often overlooked and which explains also why full scale wing sections do not always give maximum results on a model. It is the fact that models fly at angles of attack between zero and seven degrees. This is the range of angle of attack during climb and glide. Full scale airplanes must land at high angles of attack in order to reduce landing speeds to a minimum. Therefore, full scale sections must be designed to give lift without stalling or burbling between zero angle of attack and 16°. This angular range is twice that of a model and requires that the surface rearward of the maximum camber curve gently toward the trailing edge without an abrupt or sharp curve downward. If a wing section of circular arc is used it will stall before an angle of 16° is reached. In horizontal flight, however, it will give excellent results. So, as models fly in horizontal flight at angles usually between 2° and 7°, circular arc sections may be used effectively, even without consideration of the Reynolds Number.

Mr. Hilman is searching for a wing section that will climb well with flap retracted and glide efficiently with flap extended as in Fig. 6. He tells us that the extended flap gives approximately 3/8ths more area to the wing or nearly 40% more. We suggest a section similar to the one shown in "A" for climbing. The high point of the camber is well toward the trailing edge which will not reduce efficiency because during climb the wing flies at a comparatively low angle of attack. The wing also may be quite thick for the same reason. The aspect ratio of the wing should be high, approximately ten to one, because this will give a low span loading and because the climb of any airplane is proportional to the span loading.

For gliding, it is another story. In such a case, area is important, and Mr. Hilman provides it by extending the flap. The flap also should be extended to such a position that it curves well downward as shown, so that considerable lift is obtained at slow speed. Consequently, the airfoil section with the flap added provides a high cambered slow speed wing that results in low sinking velocity and long duration. Incidentally it is interesting to note that the Reynolds Numbers of the section with flap retracted and extended will be approximately the same. The smaller chord for climbing gives a lower Reynolds Number but the greater velocity in climb raises it. In gliding, speed is reduced but the chord is increased due to the flap, so in each case the product of $V \times L$ is about the same.

Mr. Hilman says that he intends to use a polyhedral wing on which the tip sections will be hinged so that during climb they are folded under the center section. During glide they will be released and extended. This we believe will not be of any advantage because, since climb is dependent upon span loading in any airplane, the folded under tip sections will reduce the span and the span loading, and consequently the climb, regardless of the greater speed that may result with the folded tip sections. In other words, the folded tip sections may increase the speed of flight to some degree but the *angle* of climb will be so reduced that the total climb per minute will not be as great even though the speed is greater.

This discussion may also answer the question of Mr. Pruett Patterson, of Harden Drive, Oklahoma City, Okla. He wishes to know what wing section is best for flying scale rubber models such as are used in the Nationals. We suggest the Grant C-8 section shown in Fig. 1 of the September '49 *"Design Forum."* This is not only efficient but the flight speed is slow compared to some other sections. Slow flight makes it possible to use a slow-turning propeller without excessive pitch. This slow flight with slow-turning propeller will result in much greater duration.

Don't forget to send your ideas and questions for publication in future *"Design Forum"* articles, to MODEL AIRPLANES NEWS, 551 Fifth Avenue, New York 17, N.Y.

Scale Albatros

A really beautiful Albatros model will be on our January cover. Plans for this plane, which was built by Frank Ehling, will appear in the same issue. The model is such a beauty, Frank won't even try it controline—he flew it from a pole!

Beechcraft Bonanza

(*Continued from page* 21)

decorated. It includes a Kollsman airspeed indicator, Kollsman sensitive altimeter, a Schwein electric turn and bank indicator, a Kollsman rate-of-climb indicator, Airpath compass, a 7-jewel Elgin sweep second hand clock, and a modified C-12A outside air temperature gauge. In addition, there are three spare holes for the installation of more specialized instruments.

Engine instruments include an A.C. tachometer, a Kollsman manifold pressure gauge and a special Beech engine gauge cluster unit made up of A.C. fuel pressure, fuel quantity, oil temperature and oil pressure gauges, and an ammeter and MB cylinder head temperature gauge, mounted front and center for easy reference to engine operating conditions.

Lighting equipment is made up of two General Electric landing lights in the wing, Grimes position and tail lights, Beech cabin dome and instrument lights and landing gear and flap position lights.

Despite the unusual appearance of the "V" butterfly tail, which has now become almost commonplace, the *Bonanza* controls are conventional in every way. A regular three-control system (aileron, elevator and rudder) is used. Rudder pedals are mounted on both sides of the cockpit, they are adjustable for comfort and the pair on the right side can be folded away when not in use to afford the front-seat passenger additional leg room. The wheel has two height positions, for comfort, and is the "throw-over" type that can be lifted over to the right side to permit flying the airplane from that side.

Elevator tabs are adjustable by a control wheel below the instrument panel. The throttle control has a "creep-proof" vernier adjustment. The engine cowl flaps are controllable to permit maintenance of the proper engine temperature by control of the amount of cooling air flowing through the engine. Ventilation and heating controls are provided. The electric landing gear and flap controls are conveniently located, and an emergency system is provided to permit manual lowering of the landing gear.

The Lucite windshield and windows are ultra-violet-proof, which means you don't need to worry about a bad sunburn after several hours in the air. The cabin is completely soundproofed. Four adjustable sunshades are provided, one at each seat, to permit the individual to shade his eyes as desired. Four ash trays and a cigarette lighter are provided. For bad weather flying, when the windshield visibility becomes restricted, a segment of the pilot's windshield can be opened on the left. Both rear windows of the *Bonanza* can be opened for ground ventilation and these have release pins to permit their use as emergency exits.

The trim personal aircraft has several novel features. For example, the main gear wheel doors close after the wheels are extended to keep out mud and dirt and prevent buffeting damage. The nose wheel tire has a mud scraper to keep dirt off the bottom of the fuselage. A retractable step is provided to make entrance to the cabin easy.

It is one thing to produce an airplane that operates satisfactorily under ideal design conditions and quite another to produce one that stands up against rugged usage that tests its ultimate capacity for service. Such a test was that of the record-smashing *Bonanza* flight from Honolulu to New York last March. Pilot Bill Odom took off in his specially-equipped craft at a gross weight of 3,779 lbs. and 36 hrs. 1 min. later landed at Teterboro, N.J., (across the Hudson river from Manhattan), after covering about 5,200 air miles. (Official record ground distance is 4,957.24 miles, a new record for lightplanes—less than 3,862 lbs.—and a new solo distance record for any class airplane.) During the trip, Odom's *Bonanza* consumed only 272 gallons, which cost a grand total of $75.00! (Veteran record-breaker pilot Odom was killed last September at the National Air Races while flying a special North American *Mustang* racing plane in the famed Thompson Trophy closed-course race.)

Another mark of the real utility of an airplane is its adaptability to special purposes. Take, for example, the *Bonanza Station Wagon*, a standard *Bonanza* with mahogany panelled cabin, quick-removable rear seat, cargo tie-down straps and rings, special hinges on the passenger door to permit it to open flat against the fuselage, and a special ambulance litter arrangement. This rugged, flying station wagon, is designed to carry two persons and 440 lbs. of cargo, one pilot and additional cargo or fuel, or four standard passengers.

It should be obvious that all of this luxury and big-plane advantages aren't available for a price-slashing, give-away tag. Such an airplane is hardly competitive with the standard tube-and-fabric "lightplane." The fully-equipped Beech *Bonanza* is priced fly-away at Wichita, Kansas, at $10,975, which is certainly not for the Sunday-afternoon time-killer type of pilot. Actually, Beech has not aimed primarily at the private pilot with this miniature airliner but, instead, believes that it finds its most useful application as a small, executive-type transport for corporation personnel. Beech believes that with this airplane, company salesmen or executives can cover more ground more conveniently than by any other means—and that specifically includes the scheduled airlines for two reasons: you cannot always get a flight arriving or leaving precisely at the time you desire and the heavies don't operate into many of the fields and over the short, frequent-stop routes of which the *Bonanza* is not only capable, but ideally suited.

For example, Beech cites a typical 12-city circuit, such as might be necessary for a salesman or executive. By automobile, this route covers 2,084 miles and requires 61 hrs. 55 mins. of actual travel time. The Bonanza covers the distance, which, incidently, is reduced to only 1,611 miles by air, in only 10 hrs. 2 mins., thereby leaving 51 hrs. 53 mins. available to the businessman for conference or relaxation. These hours actually amount to several ordinary working days, which means real money. And when the businessman realizes that this performance is obtained at a mileage identical to that of his automobile, it's a little difficult to see how any smart executive can get along without the *Bonanza* in his business.

But plenty of these executives are smart, and total sales of the *Bonanza* will have reached the 2,000 mark by the end of this year. These include the widest possible variety of users from the businessman described above, even to the Sunday-afternoon time-killer, who wants to kill time in real sky-going luxury. A big user of the *Bonanza* is the flying farmer, one of the wholly unexpected but surprisingly fruitful sources of aircraft sales in the postwar years. But whoever the user, he has the finest piece of flying equipment the dollars will buy!


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Don't Miss Page 63!

STATEMENT OF THE OWNERSHIP, MANAGEMENT, AND CIRCULATION REQUIRED BY THE ACT OF CONGRESS OF AUGUST 24, 1912, AS AMENDED BY THE ACTS OF MARCH 3, 1933, AND JULY 2, 1946 (39 U. S. C. 233)

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1. The names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Jay P. Cleveland, 551 5th Ave., New York 17, N.Y.; Editor, H. G. McEntee, 551 5th Ave., New York 17, N.Y.; Managing editor, none; Business manager, none.

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JAY P. CLEVELAND, Publisher.

Sworn to and subscribed before me this 26th day of September, 1949.

NATHAN GREENBERG, Notary Public.
[SEAL] My commission expires March 30, 1950.

Air Ways

(*Continued from page 32*)

(P. T. Taylor) 156.37; 7. *Great Britain*—E. Smith 144.57; 8. *France*—J. Petiot 133.3; 9. *Australia*—*A. K. Lim Joon (J. Tangney) 123.27; 10. *Ireland*—N. Osbourne 111.77; 11. *Belgium*—M. Ferber 110.33; 12. *Trinidad*—B. A. Bland 101.73; 13. *Norway*—J. Heiret 88.63; 14. *South Africa*—*Von Ahlefeldt (W. C. Hinks) 88.47; 15. *Holland*—*S. H. Lutjen (J. Van Der Casy) 64.6; 16. *Switzerland*—B. Bachli 63.57; 17. *Czechoslovakia*—*Lansky (K. W. Moon) 56.37; 18. *Denmark*—C. J. Petersen 28.87; and 19. *Monaco*—R. Hubertin 20.8. NOTE: *means by proxy; actual flier follows owner's name.

* *

Our first *"Air Ways"* illustration this month is a novel bat-wing design controliner, the work of Edward Soltis (57 Morningside Avenue, Yonkers 3, New York). He calls this the *Vampire*, and the fine paint job was applied with a small spray gun. Edward asks that we mention his desire to correspond with other model builders. He is interested in both free flight and controline building.

Something a little different appears in picture 2. This is a very close copy of a *Monocoupe*. The model, which has a 6' wingspan, was originally rubber powered, but a gas engine was latter added. The ship is one of the most reliable owned by Roy Long, Jr. (Airplanes & Hobbies, 15 Logan Street, Lewistown, Pennsylvania). The really unusual feature, of course, is that it is a *free flight* job.

E. J. Pithers (18 Ladbroke Gardens, Kensington, London W. 11, England) sends us photo No. 3, showing a very accurate copy of the English Percival *Prince* airliner. This controline model is built to a 1/10 scale and has a wingspan of 5' 7" with the weight 60-1/2 oz. Power is furnished by two *Ohlsson 29* glow plug engines. The outer engine is fitted with a cutout to prevent the model from swinging into the circle when the inner engine is cut first by a third wire. This model won a silver medal at a recent British Exhibition.

The jet boys are represented this month by Arnold J. Kelly (368 Woodbine Street, Teaneck, New Jersey) who designed and flew the ship in picture 4. The engine is a *Dyna-Jet*, and the plane is of solid construction; with a full tank of gas, the complete ship weighs only 2 lbs. Wingspread is 20", and the wings have a symmetrical airfoil. When the photograph was taken, he had not had a chance to try the ship out for speed. The picture, incidentally, was snapped by A. Rosenburg, his friend and fellow model builder.

The Wakefield design appearing in photo 5 is the work of Charles R. Wood (3002 Forty-sixth Street, S. W., Seattle 6, Washington). He tells us that the wingspan is 46", and the aspect ratio 9.5—1. The weight is a shade over 9 oz. On 600 winds the model has consistently turned in a time of 3 minutes in windy weather. This model is actually only a test ship and a forerunner for his dream ship which will come next. Mr. Wood learned some very useful lessons from this job, however. For example, he found that the fuse-type dethermalizer is absolutely reliable, and that one should never attempt to cure tail heaviness with positive incidence in the stabilizer, particularly in a high-powered ship such as this. The power, incidentally, is supplied by 24 strands of 1/4" flat T-56. He also found that Charles H. Grant's advice to balance such a ship by nose weight is much more practical. His new design will use a single-wheel landing gear and he will also arrange it so that the prop folds in exactly the same position each time, because he has found that if a blade folds high or low it often causes a bad spiral or spin.

The sleek little speedster in No. 6 was built by Bernard Polack (1682 Grubert Street, Montreal, Quebec, Canada). It has a 20" span and weighs 1-1/2 lbs. Power is furnished by a glow plug *McCoy 49*. No news as to the speed obtained has been received yet.

Model builders in Holland go for towline gliders in a big way and a fine example of their work appears in picture 7. This is a well-known contest winner called *Rainbow*. Although the gentleman who sent in this picture, R. Land (Zandvoorterweg 78, Aerdenhout), didn't tell us so, we presume that it is one of his designs. He unfortunately gave no details whatever on the plane.

A rather unusual speedster is shown in photo No. 8. This is *Smoky*, built by Edward Kienast (Box 406, Waynesville, North Carolina). With a *McCoy 29* engine and *X-Cell* prop, the ship averages around 124 to 125 mph. Mr. Kienast is anxious to obtain some *Tornado* propellers. Does anyone know where these may be had?

A good example of scale model craftsmanship is illustrated in picture 9. This is the Henschel Hs-123. It has a 24" wingspan and is made entirely from pine. Movable controls can be operated from the cockpit. In order to prevent the grain of the pine from showing through, the builder covered the whole ship with stiff paper and after this, finished it off with dope he had made himself with Celluloid scraps mixed with acetone. He hopes sometime to be able to put a motor in it and then fly the ship controline, but has not been able to procure a motor for this job. Mr. Walter Siegmann (27a Hamburg 11, Wolfgangsweg 5a, British Zone Germany) who constructed the model is very eager to contact an American model builder who is interested in detailed scale plans with a view to exchanging three views of actual aircraft. He has a large number of plans of German planes from 1930-45, many of them rare types.

Picture 10 shows one of the more unusual ships but one that has been found exceedingly consistent by its designer and builder, Dr. J. N. Simmons (4702 Whittier Boulevard, Los Angeles 22, California). Dr. Simmons tells us that this canard pusher had a wingspan of 60" and outflew many good models of twice its size. The plane has finally been junked, since as Dr. Simmons wrote, "It was so patched up that even the patches had patches."

The World War I enthusiasts are

represented this month by Corbett K. Bates, (1836 North Boulevard, San Leandro, California) who sent us No. 11, which shows an exact scale of a Fokker triplane. This model started as a standard kit job designed for a gas engine, but it eventually developed into a much more highly detailed display model. The ship is finished up in the colors of the original Fokker fighter. There is a complete set of operable controls as nearly to scale as available information would allow him to make them. The two machine guns are completely built up to scale, as is the dummy rotary motor. The latter contains over 600 individual parts, and we can believe Mr. Bates when he says, "This was quite a headache!"

Our last picture for this issue shows that old favorite among scale model builders, Benny Howard's *Pete*, built by Lewis Caton (4938 Montgall, Kansas City, Missouri). The model is powered by a *Hurricane* motor. When the photograph was taken the ship had not been flown but he has great hopes for its performance. Mr. Caton mentions that another member of the *Sky Kings Model Airplane Club*, of Kansas City, also built a controliner *Pete* from MODEL AIRPLANE NEWS plans, but doesn't tell us if the ship in the picture was made from our plans as well.

News of Modelers

PEN-PAL SEEKERS: Pfc. Richard C. Crowley, AF 19317569, 330th Bomb. Sqd., 93rd Bomb Group (M), Castle Air Force Base, Merced, California, is 19 years old and has been building planes for ten years . . . Gordon Macdonald, 9807 160th Avenue, Howard Beach 14, Long Island, New York, is interested in corresponding with an overseas model enthusiast . . . Jack Carcano, 37 Broadway, Howard Beach 14, Long Island, New York, also wants to contact a foreign modeler.

EXCHANGE MOTORS: Adrian Wontner, "Ash Lea", 16 Montague Road, Sale, Cheshire, England, likes controline and stunt the best; he's 15 and is willing to exchange motors and accessories . . . R. Humphrey, 97 Church Road, Swanscombe, Kent, England, would enjoy exchanging engines and even kits.

SPECIAL REQUESTS: Elwood Long, 2242 Fifteenth Avenue, Broadview, Illinois, would like three view plans of World War I airplanes to any scale—although ½"=1' scale is preferred . . . R. Holmen, Bodo Flyplass, Bodo, Norway, is 28 and has been making model ships for fourteen years. At present he is employed as an air traffic officer and holds a commercial license as pilot. During the war he was in the Royal Norwegian Air Force. Mr. Holmen wants to correspond with an active American modeler between the age of 20 to 30.

CLUB NEWS

California

Although the *Devilaires*, of Los Angeles, are fairly new in existence, they have twenty active members. In three recent contests, they took home six trophies! Officers are: Burt Hodge, president; Sid Leventhal, vice president; Darwin Adler, secretary-treasurer; and Mal Alberts, senior advisor.

On Sunday, November 27, at the Orange County Model Flying Field, Santa Ana, the *Orange County Thunder Bugs* will hold their first all stunt contest. There will be four categories—Jr. Beginners, Beginners, Amateur, and Expert. This meet is sanctioned by AMA and will commence at 8 a.m. and close at 4 p.m.

Here are the results of the recent *Fresno Gas Model Airplane Club's* free flight contest: *Class A*—Russ Basye 10:14; *Class B*—Fred Bonar 13:05; *Class C*—Robert Marlatt 8:43; *Class D*—Ralph Mower 1:21; and *Juniors*—Jerry Oldershaw 8:08.5. POINTS. *Class A*—T. Diel 531; *Class B*—M. Martin 605; *Class C*—Jack Tiftick 605; *Class D*—F. Ginder 636; and *Juniors*—F. Morgan 590.

All students of Cal-Aero Technical Institute, Glendale, interested in building and flying model airplanes are invited to join the *Cal-Aero Model Airplane Club*, which meets every Tuesday at 8 p.m. in the student canteen. Newly elected officers of the club are: Bob Hellman, president; Bill Aycock, secretary-treasurer; with the council including Art Johnson, Mike Jordan, and Don Hitchcock.

Illinois

The *Alton Model Airplane Club* is a new organization, of which Ralph Schmidt is president, with Jim Witt assisting as vice president, Bob Hovey acting as secretary (incidentally, he wrote us this news), and Melvin Wilson takes care of the dues. We quote from Bob's letter: "It has been noticed that our local 'grudge' contest has evolved into a 'rat race for trophies' between a few of we older members, and as a result the Juniors and their welfare has been almost completely overlooked. We are going to stress Junior activities during the coming year nearly exclusively." He also comments that the *only* requirement to become a member is to have the desire to further model aviation whether as an active flier or as an advisor. His address is 110 West Elm Street, Alton.

Approximately 1,500 spectators witnessed the 5th Model Airplane Meet at Chanute Air Force Base, held September

Index to MODEL AIRPLANE NEWS

January to December 1949

18. Capt. Seth Lurie sent us the results. CONTROLINE—*Class A*—Harold Springer 119 mph; *B*—H. Freezil 123 mph; *C*—Walter Toczek 134.2 mph; *D*—H. Freezil 137.5 mph; *Stunt Open*—Roy Cohen 124 pts.; *Flying Scale Open*—D. R. Hartman 119 pts. FREE FLIGHT GAS POWERED—*Class AA*—J. D. Bailey 4:15.6; *Class A-B*—B. Aikman 3:22; *Class C-D*—J. D. Bailey 20:0; RUBBER POWERED—*Stick & Cabin* (combined)—Pfc. Eugene L. Ferguson 5:53. GLIDER—*Towline*—Pfc. Clyde Zorkos 5:25. The Contest Director, Lt. Harry G. Vogler, Jr., did his usual fine job in keeping things running smoothly.

Kentucky

Norman F. Robinson wrote us that his organization, the *Louisville ABC Model Club*, has purchased a liability insurance policy, and we believe other clubs may be interested. He gives these details: "The policy is with the Trinity Universal Insurance Company, and provides protection up to $10,000 per person for injuries, and up to $5,000 per accident for property damage, to a maximum of $100,000 per accident. It is in effect wherever any member is operating a model vehicle (airplanes, boats, and cars). The premium was $92.81 for a year, and cover up to a maximum of 125 members. Our current membership is 95, and we must provide the company with a current list of members in good standing.

"We wish to emphasize that modelers should not relax their safety measures just because they get insurance. This is a new type of policy, and if the company has to settle many claims, the premium may become prohibitive, or the policy withdrawn. Incidentally, modelers aren't insured against each other."

Maryland

Members of the *Dundalk Model Airplane Club*, of Baltimore, are celebrating their sixth birthday—that is, the club is six months old! They have their own private flying field opposite their local sponsors' Chrysler-Plymouth showroom. Meetings are held every second and fourth Thursday of each month at the showroom. Wilbert Rolf, secretary, welcomes new members; write 2970 Cornwalk Road, Dundalk 22.

West Virginia

In cooperation with the Huntington, W.Va., *Propbusters*, the *Kanawha Valley Model Builders, Inc.*, held a highly successful Tri-State U-Control contest at the Henson Avenue field, September 4. Over 275 spectators attended. A feature of the contest was the Novice class, which was restricted to anyone under twenty who had not won higher place than fourth in any controline event. Here is the list of first-place winners: *Class A Sr.*—Bill Dollenmayer 93 mph; *A Jr.*—Sherman McKinney 75 mph; *Class B Sr.*—Randolph Smiley 108 mph; *B Jr.*—Richard Hopkins 86.5 mph; *Class C Sr.*—R. H. Frasher, Jr. 108.5 mph;*Class D Sr.*—R. R. Smiley; *Flying Scale*—Bill Dollenmayer; *Precision Acrobatics Sr.*—Jim Summerfield 336 pts.; *Jr.*—Sherman McKinney 75 pts.; and *Novice*—Bob Daley 70 pts. All first-place winners were awarded beautiful gold trophies and second and third place winners were awarded engraved plastic plaques.

Nats Winning Glider

A winning Class D hand-launch glider, Ray Acord's *Monster* has done well for Ray and also other contest fliers. So fine a flier that it is always used with a dethermalizer, this glider is completely described in the January '50 issue of MODEL AIRPLANE NEWS.

Engine Cooling

(*Continued from page* 31)

two kinds of metals are used for cylinder construction, such as aluminum alloy and steel, the optimum cooling for both metals is necessary. It is almost axiomatic, however, that where steel liners are pressed inside of a non-ferrous or aluminum alloy engine cylinder casting, the dissipation of heat will not be as great as on those engines which have the entire cylinder made of the same material, and properly finned for cooling. Steel liners tend to retain the heat to a greater degree. Also to consider are the frictional losses which occur at the wrist pin, crankpin, and thrust bearings. On many engines oilite or bronze bushings are used. Some engines have ball bearings, but in general, frictional losses range as high as 4% in the heat developed by the engine during operation. However, many engines have no provision made for bearing friction reduction whatsoever.

This problem of heat conductivity of the metal parts of the engine is an important factor to consider in design because of the presence of certain hot spots in the cylinder head and the head of the pistons. When selecting an engine for certain specific classes of performance, it is well to bear this in mind. Certain kinds of fuels tend to burn holes in the head of the piston because of detonation, high heat units, and poor heat rejection caused by improper engine design, or by improper cooling design of the engine after installation. Conversely, fuels which have a high volatility assist in cooling the interior of the combustion chamber by instant evaporation and will reduce the tendency of hot spots. Hot spots are indicative of poor internal engine design, or the use of improper fuel. The design problem in reference to hot spots is the presence of means to rapidly conduct the heat developed internally to the exterior of the cylinder for radiation to the cooling air.

Although there are certain inherent disadvantages occurring from the use of aluminum alloy as a material for piston construction, it is still an excellent alloy for piston manufacture. It is easily machinable to close tolerances. It conducts the heat rapidly to adjacent parts of the engine, and tends to relieve the piston head of the intense heat caused by the combustion of the fuel charge. It also assists in the induction of a cool fuel mixture charge without an inherent loss in the volumetric efficiency of the engine which is prevalent where high temperatures exist.

Lubrication of Engines. Compression in the combustion chamber is maintained by a close fit between the piston and the cylinder walls. This prevents pounding and vibration. The bearings of the crank and wristpins must also be fitted with a minimum of clearance in order to avoid an accumulation of tolerances. Because of the close piston fit, it is necessary that the mixture of fuel and oil assure satisfactory lubrication of the reciprocating parts. The heat caused by the combustion of the fuel charge, and the heat developed as a result of frictional contact between the moving parts and cylinder walls has a tendency to raise the temperature of the material and the engine as an integral part. This rise in the over-all temperature causes an expansion of the metal which changes the clearances of the moving parts and may even cause seizure of the piston within the cylinder unless proper cooling is provided to conduct the heat away. Engine operational checks on the ground will show what kind of ratio of the fuel-oil mix is most suitable for various kinds of flight performance.

It is well to emphasize that the lubrication qualities of the fuel-oil mixtures are affected by the excessive temperature which causes a reduction in the oil viscosity and a breakdown of the lubricating qualities. For satisfactory engine performance, the fuel-oil mixture must resist breakdown or separation in order to sustain the heavy frictional loading caused by the heat of the moving parts and bearings. The portion of the lubricating fuel mixture which reduces piston friction operates under a high temperature strain because the heat of the piston must be transmitted through the lubricating mixture to reach the cylinder wall.

Present model airplane engines depend entirely for internal lubrication on the fuel-oil mixture for proper lubrication, hence the mixture to some extent functions as an auxiliary internal coolant. The oil and fuel are mixed in a proportionate ratio and the reciprocating parts are subjected to a contact and to a vapor lubrication bath during engine operation. The amount of heat which is dissipated by the auxiliary coolant is in proportion to the ounces of fuel burned per minute, the specific heat of the fuel-oil mixture, and the difference existing between the temperature of the fuel mixture and the internal temperature of the engine.

The fuel-oil mixture is subjected to the heat of combustion and the friction developed by the reciprocating parts, whereas the heat developed by the friction of the bearings, crankpin, and wrist pin, is a transformation from mechanical to thermal energy, and also includes the internal friction of the lubricant as well.

COOLING OF CYLINDER HEADS. When the air stream flows over and around the cylinder, the front of the cylinder receives greater cooling than the aft side because of the eddying condition in the air flow created at the aft surface of the cylinder, similar to that which occurs in the flow of air past a cylindrical section or strut. This kind of air flow tends to cause an unequal expansion of the cylinder as a result of the uneven cooling, and prohibitive deformation can be prevented only by keeping the temperature of the outside of the cylinder within the range of proper engine operation temperature. However, any clever racing pilot knows that with high engine temperature, and if the clearances are maintained by proper lubrication, an increase in the thermal efficiency as well as the mechanical efficiency is possible. The trick is to obtain the right combination of operational temperature and cooling. Changes in the engine temperature cause changes in the fuel induction and cause trouble with the mixing valve setting to maintain optimum conditions. Many racing pilots warm their engines to suit the fuel mixture they are using. However, racing fuels often have a minimum of lubricating oil present, hence prolonged warming on the ground is not desirable.

SPARK OR GLOW PLUG COOLING. Spark plugs or glow plugs are subjected to intense heat during engine operation. This heat must be conducted away through the screwed contact joint in the cylinder head. The conductivity of a threaded connection, especially between ferrous and non-ferrous metals is considerably below that of an integral metal or similar metal parts. It is, therefore, expedient to provide for proper cooling of the spark or glow plugs on racing engines. In certain engine designs, lack of cooling for the plugs is evident and may cause the engine to have a short life in comparison to other engines where the plugs may be easily cooled. If your engine installation is completely housed within the fuselage or cowl, be certain that a stream of inducted air is diverted past the plugs if high performance is desired.

FINS ON ENGINE CYLINDERS. An investigation of various engine manufacturers reveals that most engines have fins which possess the same thickness at the root as at the extremity. This also applies to fins on the cylinder head. As stated previously, this tends to reduce the heat dissipation remarkedly, and a rework of the fins to a chamfered edge is recommended. Usually, the extremity of the fin should be reworked to one half the root thickness. This tends to accelerate the heat flow from the cylinder walls and also increase the available area for heat radiation.

A check on engine cylinder designs and heads shows that sand castings, permanent mold casting, pressure die casting, and machined non-ferrous metals are used in the manufacture of model airplane engines. The fact that these methods of mass production are used militates against the refinement of chamfered cooling fins on the cylinder walls and heads. For maximum cooling, racing engine modelers should rework the fins by manual or machine methods to gain an increase in cooling efficiency. Where the dimensions between the fins are small, emery cloth may be used as the abrasive to chamfer the metal parts as required. In fact, most engines on the market can be considerably improved by deleting excess fin material. Engines with integral or threaded heads provide more fin area than those which must have the fins cut away for screw inserts. The screw inserts also cause a concentration of heat, since they are of steel, in an aluminum head. Refer to Fig. 2. During any of the rework operations recommended here, however, keep the engine ports closed to prevent the ingress of abrasive or metal filings.

Flash

(Continued from page 5)

5 engines and features a thinner wing and redesigned empennage.

SURPRISE of the show was the terrific speed and extraordinary maneuverability of the mysterious English Electric Company *Canberra* jet bomber. This super-fast craft is powered by two Rolls-Royce *Avon* turbojet engines developing 7,500-lb. thrust each, the most powerful turbojet engines in the world. A low-level flight demonstration of the carefully guarded bomber proved it to have jet fighter maneuverability, although it is capable of carrying 10,000 lbs. of bombs to altitudes as high as 50,000'.

DESPITE the tragic death of Bill Odom at the 1949 National Air Races (in a crash into a house containing a mother and her small baby) and the emotional recriminations voiced, it is now certain that the annual event will continue to be held, although with several changes. Firstly, it may be moved from Cleveland to some other city whose airport is distant from residential property. The unlimited-class closed-course races may be abolished in favor of a new class of small-engined Thompson Trophy racers, which will return original design to this event. But it is already certain, by Air Force directive, that there will be no more closed-course racing for jet fighters. The Lockheed F-80 race in 1947 produced wrinkled skin and battered leading edges on the planes that flew the closed course. The 1949 closed course event saw two North American F-86A swept-wing fighters complete the race in damaged condition, particularly the winning plane, which lost its elevator and buckled the after fuselage. Capable of high speed with complete safety at high altitude, the operation of jet fighters at maximum speed, including steep banks, "on the deck" has been ruled entirely too risky by the Air Force.

DOUGLAS Super DC-3 sales program has already borne fruit with an initial order for three from Capital Airlines. The new plane features redesigned wing and tail surfaces, new engines, greater capacity and improved performance. A possible winning combination is the use of the Armstrong-Siddeley *Mamba* turboprop engine in the standard DC-3. These engines produce 1,400 hp and have the famed turboprop advantages of low noise and lack of vibration. The British company has been test flying a *Mamba*-powered converted DC-3 and their tests indicate that the combination meets fully the latest ICAO requirements, whereas the standard DC-3 does not.

CHICAGO and Southern Air Lines has become the fifth U.S. airline to purchase Lockheed *Constellation* transports. C & S has announced the purchase of five "Connies" at a cost of slightly more than one million dollars each. This brings to a total of 213 the number of Connies delivered or

on order. Previously, TWA, Pan American, Eastern and American Overseas airlines have placed Connies in service. Numerous foreign airlines also use the four-engined, 300 mph airliner.

LATEST move in the on-again-off-again procurement of training planes by the Air Force is cancellation of order for 100 Fairchild T-31 primary trainers at a cost of $8 million. The T-31 was to have been an Air Force version of the Navy XNQ-1. Meanwhile, the Beech T-34 *Mentor* and TEMCO T-35 trainer are being re-examined for possible procurement.

NAVY HAS revealed what is believed to be the first actual emergency use of a jet ejection seat by a Navy pilot Lt. Jack Fruin "pressed the button" when his McDonnell F2D-1 *Banshee* twin-jet fighter went out of control while doing 600 mph at 30,000'. Fruin was injured when he struck the water but the seat equipment worked perfectly. Air Force has tested the seat with volunteers, who were shot out of the rear seat of a Lockheed TF-80C trainer over the Pacific, but this is the first U.S. use of the device in an actual emergency.

MARTIN XB-51 is revealed as one of the strangest-looking jet aircraft ever built in the U.S. Two of its engines are mounted in nacelles suspended from the lower, forward fuselage and the third is mounted in the extreme tail. A tandem bicycle landing gear, similar to that used on the Boeing XB-47 and the Martin XB-48, is used. The stabilizer is located at the extreme top of the fin. The pilot is located in a conventional bubble canopy but the second member of the crew, the radio-operator-navigator, is buried down inside the fuselage behind the pilot with only small windows for vision. The wings and tail are swept back at an angle of 35°. Lateral control of the airplane is by "spoiler" controls in each wing. Instead of providing increased lift (as in the conventional airplane), these controls "spoil" the airflow when they are raised and thus destroy the flow over one wing and cause it to drop. Advantages of the method is that it permits the use of nearly full-span flaps, which are badly needed in swept-wing, highly-loaded jet aircraft. The new bomber is actually an attack airplane (no longer so-called by the Air Force) intended for low-altitude ground-cooperation tactical missions. No production orders are expected for the plane.

COL. BERNT BALCHEN, famed Arctic explorer, recently piloted a Boeing B-29 *Superfortress* bomber on a nonstop flight from Anchorage, Alaska, to Oslo, Norway, a distance of approximately 4,000 miles in 22 hrs., 30 min. Balchen, now an Air Force Colonel and expert on Arctic flying problems, was accompanied by a crew of eight. The B-29 took off with 3,800 gallons of fuel and had 600 gallons remaining upon landing. Balchen made the flight as part of his current survey of the possibilities of landing fields near the North Pole.

AVRO C-102 jet transport, which suffered the indignity of a forced landing during one of its first test flights, has now been repaired and resumed its flights. The trouble resulted from malfunctioning of the landing gear and a belly landing was made. The four-jet liner is powered by Rolls-Royce *Derwent* 5 turbojet engines and has a cruising speed of 417 mph at 30-40,000'. Built in Canada, it was designed for Trans-Canada Airlines for short-haul service. U.S. airlines will watch this service closely, for it parallels their own much more closely than most European routes. Another test flight accident destroyed the second Saunders-Roe SR-1A twin-jet fighter flying boat. The first crashed last August. A third and final aircraft is still flying.

CANADIAN plans for manufacture of 100 North American F-86 *Sabre* swept-wing jet fighters are going ahead with announcement by Canadair, Ltd., of plans for a $2 million expansion of its plant outside Montreal. Canadair, Ltd., will build the sleek fighters under license arranged by the Canadian Government. Although final decision has not yet been reached regarding the engine to be used, it now appears to be a choice between U.S.-built General Electric J-47 or Canadian-Built Avro *Orenda* turbojet engines.

INDICATIONS that much of the instability may have been removed from the helicopter is seen in the recent accomplishment of a one-hour flight by a Doman helicopter without the pilot touching the controls. Previously, helicopter pilots worked the controls steadily and with considerable fatigue in current designs. The Doman design, was flown at Danbury, Conn. by test pilot Al Bott, without changes in control stick, pitch control or throttle setting. First production version, the Doman *Pelican*, will be powered by a 245 hp engine and carry either seven passengers or 1,000 lb. of insecticide for spraying or dusting.

LATEST round-the-world-by-lightplane attempt is scheduled to be that of Jack Brazil, who plans the flight in a Johnson *Bullet* personal plane powered by a Continental engine of 185 hp. First leg of the flight will be an attempted Oklahoma City-Rome flight of 5,500 miles, which would break Bill Odom's present record. Last leg, a 6,300-mile flight from Tokyo to Oklahoma City, would smash this record.

Hell Razor

(*Continued from page* 11)

strips and finish sanding wing to a smooth airfoil section.

Elevator and stab are made of 1/8" plywood to the sizes as shown on the plan. *Flytex* hinges were used for the elevator, and a steel angle acts as elevator horn. This horn is bound in place with sewing thread and then cemented.

Assembly. Place stab and elevator flat on the upper surface of the bottom shell as indicated on plan and fasten with two 4/40 machine screws (drill No. 43 hole in the metal casting, then tap 4/40). Cut out

bottom and top of fuselage so the elevator will move 1/4" up and 1/4" down.

Detach fairing block, then glue the wing to the top shell of fuselage as shown. On the record breaking model, the entire wing is skewed 1/8" from true center. The inner wingtip (we refer to the tip nearest the center of the flying circle) is 1/8" *ahead* of the center position and the outer tip 1/8" *behind*. This simply means that when you are gluing the wing in place, consider the bellcrank mounting bolt hole as a center, and pull the inner wingtip 1/8" ahead of the position it would occupy if the wing and fuselage were mounted exactly square with each other. The reason for this is simple: when the ship is flying at high speed, the line pull tends to force the inner wing back an eighth of an inch or so. The whole ship thus turns inward a bit and the motor thrust line is automatically offset inward to give a good approximation of "circular flight." This trick is good for a few extra miles per hour, yet the model is entirely safe on take-off, with no tendency to head for the center of the circle, as would be the case if we had used motor offset.

The wing is mounted with about +3° incidence. If you follow the airfoil section on page 12 accurately, and glue the wing in place flat on the fuselage, the leading edge will be 3/16" above the fuselage top; this assures correct incidence.

Install the push rod. Cut out fairing block to fit over wing, and cut side opening for the exhaust stack. Drill two holes in the maple wing spar as shown on plan, then cement the fairing block in place. The crossbar, which is mounted in the bottom of the fuselage, is held in place with three 4/40 machine screws, two on the inner side and one on the outer side of the fuselage. This piece is cut from 1/4" thick aluminum or magnesium.

Drill two holes from inside of the top shell through the fairing block. Then with top and bottom fuselage halves in place, drill holes from the top into the crossbar, using a No. 35 drill. Tap the crossbar for 6/32 screws. Although the original ship didn't seem to need it, it might be a good idea to insert a 1/16" diameter metal pin in the wood at the extreme tail of the fuselage, and drill a hole in the metal casting for the pin to slip into; then you can be certain the two fuselage halves will stay in perfect alignment.

A tank form block is made of 3/4" x 1-1/2" x 4" pine. Then tin is folded around this form and soldered. The front is soldered in place first. Then install 1/8" I. D. tube as shown, and finish the balance of the tank. A No. 60 drill hole is used for venting the tank.

Finish-sand the entire model. Then apply two coats of sanding sealer and paint with your favorite color. Sandpaper the bottom shell with a rough paper until a smooth surface is obtained; then sand again with fine paper. A higher finish can be obtained by using automobile rubbing compound, and then applying several coats of wax. If this casting is made of pure magnesium, keep all filings away from any open flame as they will burn rapidly.

The dolly used with this model is of a design similar to that now being used by most modelers in the Midwest, and which we believe was originated by Tony Grish.

The finished model should balance evenly when held up by the wing tips at the leading edge.

Metal-cast bottoms were found to be of great advantage in building this model. The heat of the engine is transferred to the metal bottom shell, thereby keeping the engine cooler during flight. Although a close fitted cowling is used, there is no "tunnel" for cooling air, as seen on most such models. However, be sure you cut the "notch" in front of the cylinder head, as shown on the plans and photos; then you will have no cooling difficulties. We also found less vibration with the metal fuselage bottom, which gave us a smoother operating engine and last, but not least, we had a safer and longer-lasting model.

I am sure that if you follow these instructions, you too will be able to accomplish big things in the speed events.

Lots of luck!

The H-L Glider Question

(*Continued from page 30*)

yet how many model builders could launch a glider with the same wing area to half that altitude. There are very few who can, or could with a reasonable amount of practice. This is the primary reason why few attempts are ever made on the hand-launch record in the Class D category. Just try to picture a young model builder under sixteen, trying to set a record in the Class D category. Unless there are "Super Boys" in our midst, it cannot be accomplished with a reasonable chance of success.

The second contributing factor for maximum performance depends largely on the individual model builder. The better you are at hand-launching, the larger the tail surfaces can be made. This serves to slow the recovery necessary to utilize the power of your arm. This proportional increase in tail area also increases the total lifting area of the entire model, providing additional advantage for the musclemen of modeldom.

The only way this advantage can be reduced or eliminated entirely is to have the rules changed to employ a catapult as the method of launching. Since a rubber catapult is easy to make, it would be ideal to use as our launching mechanism. The length and number of strands to be employed in each class could be stated in the rules. The rules should also state that the contest director will supply the catapults to be used. The latter stipulation will eliminate the possibility of a model-builder substituting his own "souped up" catapult. With the aforementioned changes or similar ones, we would undoubtedly see an increase in contestants at a glider event. Certainly, both spectators and contestants would enjoy the event a great deal more. As for the contestant, he could conserve the energy in his throwing arm to wind a rubber motor or crank an engine, as the case may be.

The accompanying sketch is of a typical catapult design, which is in reality a converted hand-launch design.

Using six strands of 1/8" flat, 18" long, the model will consistently do over a minute and a half when adjusted.

In the event you have a hand-launch glider design that is a favorite with you, just follow the same procedure for conversion to a catapult glider.

The use of a proven design of your own or the one sketched here, will enable you to get started on the right track with excellent results.

By now, you may have surmised that we are definitely for the use of a rubber catapult, as the medium for launching. In the event you feel as strongly as we do about this situation, jot down comments or suggestions of your own on this problem, and address them to the Academy of Model Aeronautics, 1025 Connecticut Avenue, N.W., Washington 6, D.C.

The AMA is doing all that is possible to keep the rules as fair as possible to everyone. We feel certain that if a sufficient number of model builders send in their comments or suggestions, the AMA will act promptly and in accordance with public opinion.


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THE NEWEST-NEW

RITE MADE IN U.S.A. PITCH

WORLD'S FINEST

Formula 22, All-Purpose Utility Cement

A few months ago you were promised "Rite-Pitch" would produce a companion pro' ıct to its sensation making Formula 11 Model Hobby Ceme' ıt.

IT'S AVAILABLE NOW

The newest-new sensation does everything you can ask for when you want a cement that is the strongest in the world, and yet is fast drying. Yes, Formula 22 is the strongest Fast Drying Cement in the world. The amazing "Double Action" of Formula 22 makes any job you do easier and stronger.

FORMULA 22 IS PACKED FULL AND SOLID IN THIS SUPER KING SIZE 10c TUBE. USERS HAVE ALL TOLD US WE GIVE THEM MORE FOR THEIR MONEY THAN ANY OTHER QUALITY CEMENT PRODUCER.

FORMULA 22 AND FORMULA 11 WILL BE AVAILABLE SOON IN WORLD'S LARGEST 25c TUBES. SAME SUPERIOR QUALITY, BUT MORE FOR YOUR MONEY FROM "RITE-PITCH" AS USUAL.

FELLOWS!! SEND IN YOUR SUGGESTIONS FOR NEW USES FOR FORMULA 22 ALL-PURPOSE UTILITY CEMENT.

Bob Roberts

WILL SEND YOU A \$5.00 BILL FOR EVERY SUGGESTION USED IN OUR NATIONAL ADVERTISING . . . OR 3 TUBES OF FORMULA 22 EVEN IF IDEAS ARE NOT USED. LADIES' SUGGESTIONS ALSO WELCOMED.

DEALERS—All leading jobbers can fill your orders promptly or write us.
JOBBERS—All nationally advertised "RITE-PITCH" products are available before advertising. ORDER TODAY!

REG. U. S. PATENT OFFICE

Bob Roberts
32 West 5th Ave. Gary, Indiana

MODELERS! See your local dealer first—or order direct.

AUTHENTIC DETAILING

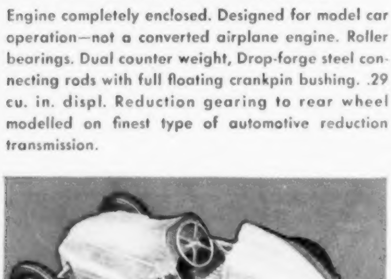
New steering wheel! New wheel guards! New front spring suspension and radius rods! Hand brake • Fuel pump • Radiator grille • Outside exhaust • Treaded rubber tires.

REALISTIC ACTION

Give it a little push . . . see how the new O & R car rolls free! That means it will wheel out from a standing start and roll, not wobble, to a stop after the engine cuts. Pick the car up and turn it over . . . feel its sturdy, substantial construction. Now snap off the body and note such outstanding features as integral gas tank, integral pressure baffle cooling system, unique starting clutch, torque-smoothing fly wheel.

"OUT OF SIGHT" ENGINE

Engine completely enclosed. Designed for model car operation—not a converted airplane engine. Roller bearings. Dual counter weight, Drop-forge steel connecting rods with full floating crankpin bushing. .29 cu. in. displ. Reduction gearing to rear wheel modelled on finest type of automotive reduction transmission.



Unpainted car-in-production showing die-cast aluminum alloy body and accessories. Wheelbase 6".

EASY TO START — EASY TO HANDLE — AND OH, SO EASY TO LOOK AT!

Here's the new Ohlsson & Rice true-scale replica of a 100 cubic inch displacement midget racer, designed from the famous racing car that held the No. 1 position at the Los Angeles Gilmore Racing Oval. Here are new *realism* and *authentic detailing* in the world's most beautiful miniature midget car! Here also are more realistic operation, full safety, easy starting, and sensational ease of handling due to the new O & R starting clutch integral with transmission! More than 13 months' research and engineering have gone into the design, development, and testing of the new Ohlsson & Rice model car. It's completely new from the ground up, yet down to earth in price . . . Assortment of beautiful color combinations to choose from. Select yours now from your favorite hobby dealer. The ideal gift for yourself and modeler friends this Christmas. If not available locally, address the customer service department.

Available as Car with Engine, Car without Engine, and Build-a-Car Kit

MODELERS! Name the new O & R miniature car and win a prize. Get official entry blank and full details from your dealer. DO NOT WRITE FACTORY.

OHLSSON & RICE *Standard of the Model World*

EMERY AT GRANDE VISTA • LOS ANGELES 23, CALIFORNIA